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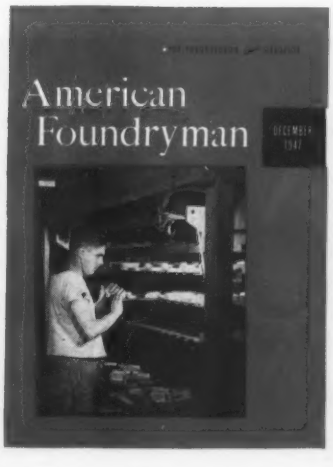
VOLUME XII, NUMBER 6

American Foundryman

December, 1947

Official publication of American Foundrymen's Association



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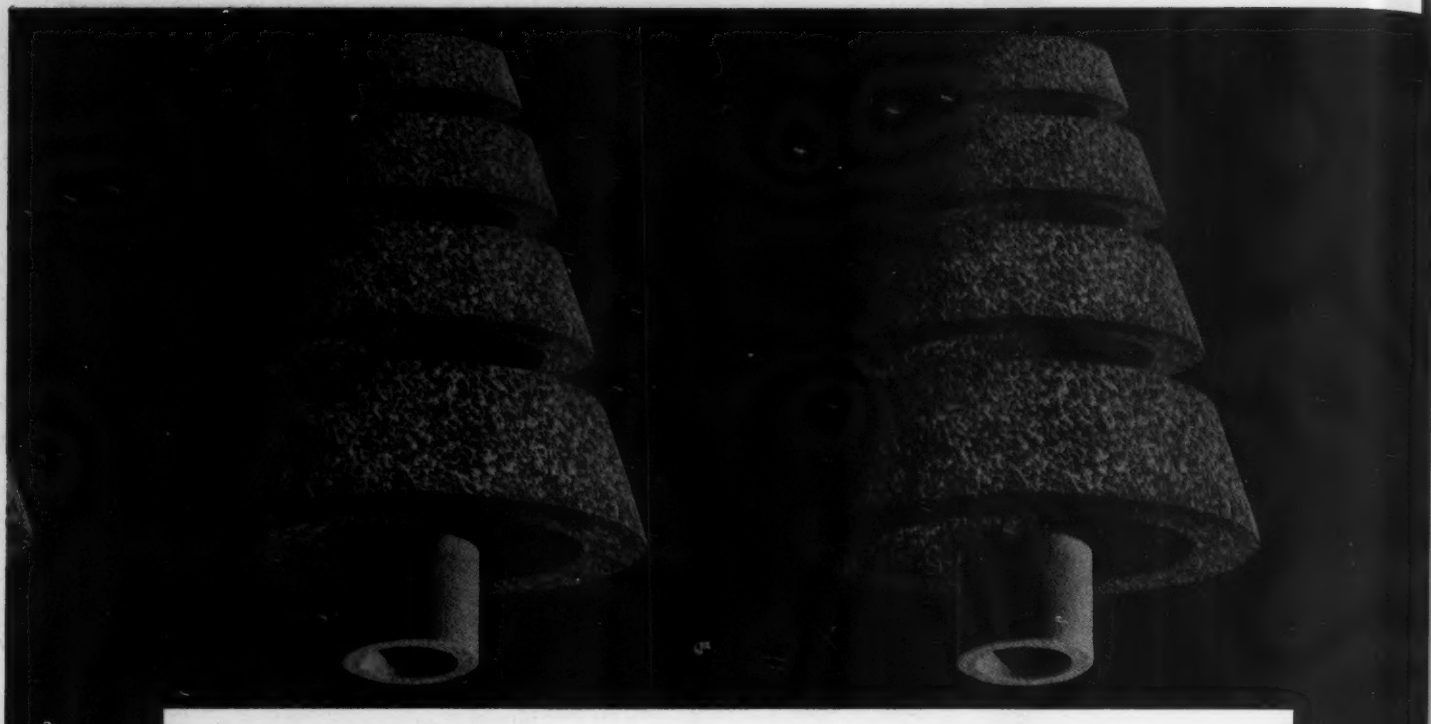
This Month's Cover

Vertical-type, recirculating gas-fired core ovens installed during mechanization of Trafford Foundry, Westinghouse Electric Corp. (page 22, this issue). During baking, cores are conveyed from second to first floor, where they are assembled and conveyed through a horizontal paste-drying oven to the core storeroom.

Published monthly by the American Foundrymen's Association, Inc., 222 W. Adams St., Chicago 6. Subscription price, to members, $4.00 per year: to non-members, $6.00 per year. Single copies, 50c. Entered as second class matter July 22, 1938, under the Act of March 3, 1879, at the post office, Chicago, Illinois. Additional entry at Ann Arbor, Mich.



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MANAGEMENT MEANS COMMON SENSE TACT AND TRAINING

Excerpts from address by E. M. Currie, President, London Branch of Institute of British Foundrymen, Sept. 24, 1947—reprinted from "Foundry Trade Journal."

TOO OFTEN DO WE SEE IT STATED that an efficient and successful industry, and an efficient and happy nation, depend entirely on better use of money, machines, men and research and invention. But behind all that, the real efficiency of any industry, and indeed of the nation, lies solely and entirely in the effectiveness of its management.

Decidedly is this so in our own particular industry, and I do want to emphasize, particularly to the younger generation, that management is neither more nor less than the wise guidance of human beings. Inanimate objects are not managed; it is the men and women who operate the machines, processes and methods who are "managed."

Today we hear much about apprentice training in schools and foundries. Important though this be for a long term view, it is my opinion that our vital immediate need in the foundry today is for supervisor and foreman training in management.

The average foundry foreman today is a struggling transitional product between the old-time craftsman, promoted because he had some disciplinary sense, and the modern young man, excellently equipped in academic work but with little practical and organizational experience. The more important points of character, such as tact, personality and common sense, remain a pious hope that they will be acquired by the man without too much upset of industrial processes.

No man should be appointed to manage his fellows on any level of supervision who has not received the fullest and most comprehensive training in his particular sphere of activity. Good management is not an inherited characteristic—it comes only from arduous and prolonged practical training, observation and experience continuously and actively applied.

The immediate job of management is not to provide ever higher physical property metals that the present-day designer cannot understand and cannot even use, but to manufacture a well-finished, perfect surface, accurate shape and sound product, to consistent clear-cut and well defined commercial standards, day after day, year in and year out. Materials must be closely controlled in every stage of manufacture, being continuously tested and proved, and with the closest collaboration with the user for his service reports.

There is a need to improve and redesign present equipment to give a higher productive output with less expenditure of human energy. Foundrymen must study in greater detail the flow lines of all materials through the foundry. In over thirty years in the foundry industry, and having visited a countless number of foundries, I would unhesitatingly state that in 95 per cent of the foundries I have seen, an intelligent study of material flow lines would result in much more economical working and greater output with little or no alteration and addition to equipment or the labor available.

There must be a proper use of time and motion studies. Foundry operatives are never antagonistic to such work if it is instituted and approached in a proper manner and their active cooperation requested on the basis of the eventual reduction of human effort.

Finally, remove forever the stigma that foundries are filthy places to work in. Attention to safety, hygiene and good housekeeping undeniably pays good dividends.

I would like to see a law passed that no heavy industry workman be allowed on any public transport vehicle in his working clothes. One of the freedoms of democracy need not be license to transmit sand and coal dust to all and sundry.

We welcome the plans and promises of financial assistance toward our individual industrial research plans, and toward improved facilities for more scientific and technical education. But let us also guide ideas toward a reduction of controls and an encouragement to individual enterprise in an industry which is second to none in its interest and opportunity for the progressive-minded men and women of today.

EDITOR'S NOTE—*While the above material is strictly British in origin, the subject matter is universal in application. Such current foundry problems as personnel training, emphasis on quality, safety and hygiene work and, above all, the dependence of industry on effective control are the concern of foundry management wherever castings are molded and poured.*

MECHANIZING THE FOUNDRY

C. B. Dick
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FACED WITH PROBLEMS OF LABOR, costs and quality, the modern foundry is finding mechanization essential to its competitive position in supplying the needs of assembly industries. The twofold objective of mechanization is increased productivity in a given area and improved working conditions essential to attracting efficient, high-caliber labor. Foundrymen are familiar with the aversion of labor to foundry work when cleaner, lighter jobs are available.

Experience has shown that mechanization alone is not a cure-all for foundry problems. Along with careful equipment and layout engineering and the best available auxiliary equipment should go a program for improved working conditions and a complete employe training plan for all levels from supervisor to supplyman. In short, "mechanization" may be futile without "modernization."

The introduction of mechanized processes into the operation of a foundry requires that the old-time foundryman, steeped in the secrets of his art, be supplemented by technically trained personnel for maintenance of equipment, quality and process control, and supervisory positions.

It must be recognized at the start that problems of a mechanized foundry are minimized when sufficient and competent mechanics are assigned to the upkeep of mechanized equipment. To emphasize this point it may be pointed out that the number of electric motors at one typical foundry has doubled in the course of mechanization to a total of 574 with a connected load of 6150 hp. The maintenance men are faced with an equivalent increase in mechanical equipment, power lines, and air, gas, steam and hydraulic systems.

Quality and process control is lifted from the hands of the individual craftsman and placed on a mass-production basis in the hands of trained technicians. In general, the job of the old-time artist-craftsman is subdivided for performance by "machine operators." However, an apprentice training program continues to develop personnel for the more skilled operations such as patternmaking, intricate molding and coremaking. Finally, a mechanization program calls for additional

Fig. 1—New fluorescent lighting shown in the medium molding department improves working conditions—a vital part of modernization.

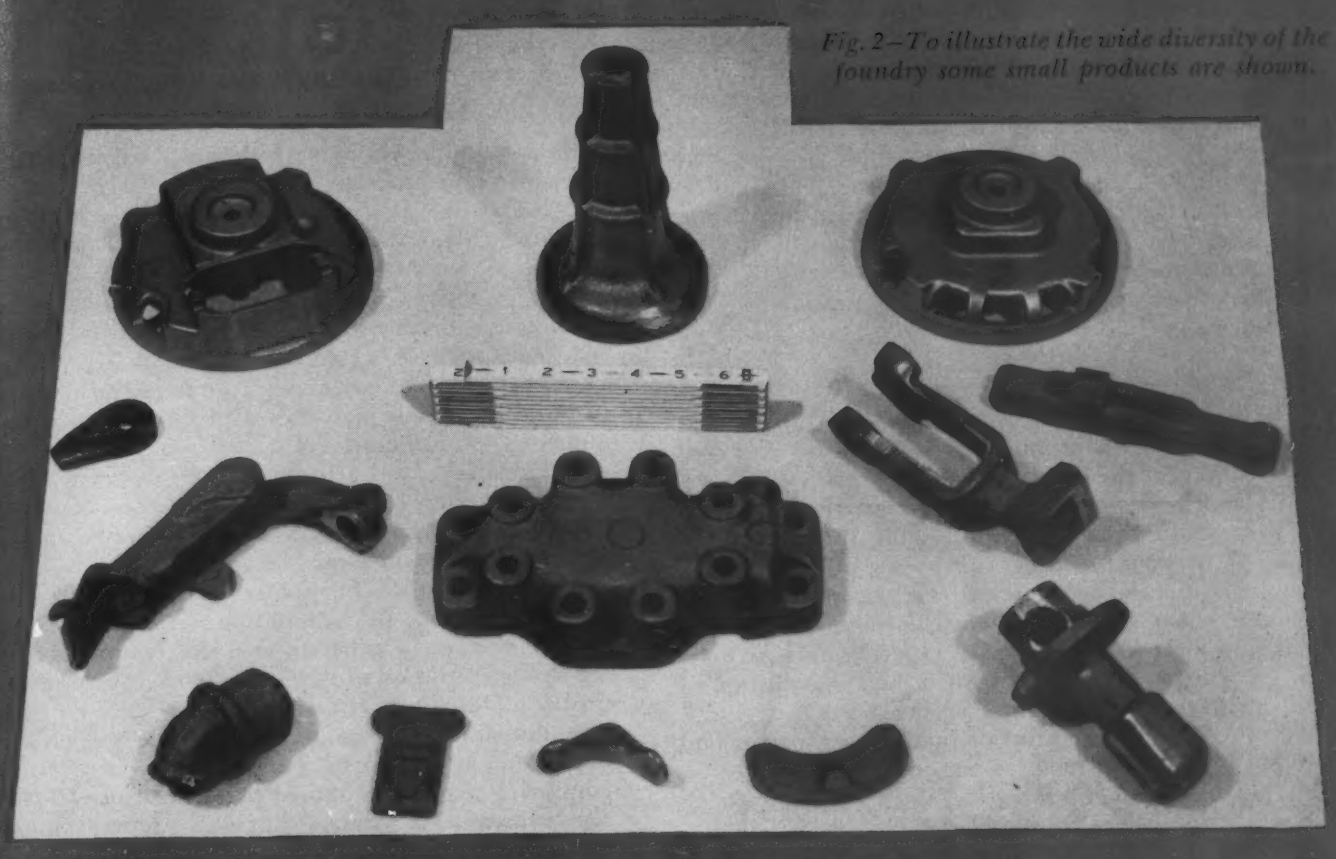

Fig. 2—To illustrate the wide diversity of the foundry some small products are shown.

Fig. 3—In contrast to the small castings is this steam turbine base. One of the largest products, it weighs approximately 80 tons.

technically trained metallurgists to take over both line supervisory and staff control functions.

Thus it is apparent that worker training and qualified supervisory personnel are essential to attainment of the full advantages of mechanization in a diversified foundry.

For a full comprehension of these problems a realization of the advantages of mechanization is important. These can be approached from the point of view of both employe and employer. The summaries that follow serve to emphasize the fact that in mechanization we have a twofold problem.

I—Mechanization Advantages to Workers

1. Elimination of many of the heavy lifting and other laborious operations which were in the past considered part of the foundry work.
2. Improved working conditions, particularly from a dust-suppression viewpoint. This can be accomplished by concentrating the points at which dust, smoke, and fumes are created and by providing the necessary hoods, ducts, exhaust blowers, and filtering medium in order to collect the objectionable particles at the source and dispose of them before pollution of the air in the foundry can be effected.
3. Provision of a means of increasing earnings and living standards of foundry personnel.

II—Mechanization Advantages to Management

1. Increased volume with a given floor area.
2. Production of castings with closer dimensional tolerances by substituting mechanical for manual foundry operations. Closer tolerances reduce machining operations.
3. Maintenance of the competitive position of casting with respect to other methods of producing metal forms such as fabrications and stampings.
4. Attracting to foundries workers who are now employed elsewhere because of working conditions prevalent in foundries prior to mechanization.
5. Potential savings resulting from the elmination of numerous manual operations, such as handling of sands, binders, and oils; hand filling and ramming of core boxes and flasks; hand cutting of sprues, gates, and runners, transportation of castings about the shop; and many others.

If a foundryman is to avail himself of the full advantages of mechanization he must first make a complete study of his own particular problems. Such a study can well be taken in two steps; an independent engineering survey of present conditions, and a series of inspection trips to other already mechanized foundries. The engineering survey would consist primarily of an accumulation of data on production requirements, type and variety of product, sequence of operations, and plant layout.

In general, before undertaking such a survey a broad understanding of what mechanization applied to foundry operations takes into consideration is essential. The tabulation of considerations that follows is logically broken down into two parts—basic operations and auxiliary equipment. Experience has shown that the auxiliary equipment is of equal importance to the basic equipment if full advantage of foundry mechanization is to be obtained.

Fig. 4—The weigh lorrie at the top of the picture serves the sand mixer. Sand is weighed by the lorrie which then transports it to the mixer for batch mixing.

Basic foundry processes which must be considered in mechanization programs are the following:

1. Metal melting—including material handling, weighing charges, cupola charging, slag disposal, and delivery of metal.
2. Coremaking—including such operations as unloading and drying core sands; weighing and mixing core sands with oil, water, and binders; delivery of prepared core sand to coremakers; ramming cores by use of sandslinger, jolt machines, and blowing machines; and use of continuous ovens for drying cores.
3. Finishing cores after baking by use of checking fixtures, grinders for sizing cores, continuous ovens for baking the paste used in assemblying cores, and the protective wash which may be applied.
4. Transportation of molding sand from the sand-conditioning unit to the molding station by means of belts, elevators, or other mechanical equipment, and the storage of this sand in the manner most convenient for the molding operation involved.
5. Preparation of molds through the use of semi-automatic or automatic molding machines, usually employing machine-mounted patterns of the all-metal types; mechanical means for handling flasks, ramming flasks with sandslingers, flask fillers used in conjunction with jolting and squeezing equipment, and blowing sand into the flasks; use of core-setting jigs and mechanical handling devices for locating and setting cores; and the adaptation of power-driven or roller-type conveyors to convey finished molds to pouring position.
6. Removal of castings from the mold by the use of mechanical shakeout units, which usually are part of a sand storage and distribution system used for mechanically moving the sand from the shakeout position to storage bins, thence to sand mixers, where the sand is reconditioned prior to its return to the molding machines.
7. Cleaning of castings prior to chipping in order to remove any remaining core or molding sand through the use of machines employing an abrasive consisting of sand, metal shot, high-pressure water, or a mixture of sand and water to effect the removal of the excess sand and obtain required surface finishes. Rumbling barrels are also used for this purpose.
8. Chipping and grinding of castings through the use of stationary or swing-type grinders, cut-off saws, chipping hammers, sprue cutters, and other mechanical devices necessary to prepare for final machining.

To obtain full benefit of mechanization the following auxiliary facilities and equipment are vital:

1. Accurate and substantial pattern equipment. Means for quick changing of patterns is necessary to minimize the shutdown time of the equipment during the change-over period.
2. Substantial flasks which will maintain tight joints and accurate pin centers. These are necessary to prevent run-outs and shifts between the mold sections.

Fig. 6—An underfloor power-driven chain moves cars in and out of 16 ft gas-fired recirculating core ovens.

3. Core of the correct dimensions. The necessity for hand filing and fitting of cores during the core-setting operation must be eliminated if full advantage of the mechanized equipment is to be obtained.

4. Facilities to provide a continuously available supply of metal at the proper temperature and of the right chemical analysis for the pouring of castings. Greatly increased costs are the inevitable result if mechanized molding units are forced to shut down due to a lack of molten metal.

5. Facilities to provide a dependable supply of molding sand for filling of flasks or core boxes must be assured. This, of course, means that accurate sand control methods must be provided in order that moisture content, permeability, green strength and other variables are controlled to the extent that the operator using the sand can almost completely forget these factors and concentrate on mold or core production.

6. Facilities, such as traffic lanes and storage space, to expedite production control. An important auxiliary to mechanized production of castings is planning, both from a personnel and order scheduling standpoint. Personnel should be flexible so that they can be readily shifted from position to position in the line. Production planning is necessary to assure a supply of cores for the molding lines. This usually necessitates the use of storerooms for cores, where the required number can be stored before the pattern is put into work. Orders must also be scheduled to the molding units to take advantage of available flasks by running orders using the same flask. Coordination of the melting and molding facilities is important, particularly when metals must meet a variety of specifications.

7. Lighting (Fig. 1), ventilation, and safety facilities. Under the heading of improved working conditions, modern (preferably fluorescent) lighting as well as a good dust collection system, ample guards, limit switches and warning signals should be provided. Safety equipment can often be installed beneath or above the floor level to lessen interference at work stations.

Gray Iron Foundry Modernized

An example of the application of the general principles in the mechanization of a foundry is the recent modernization at the Trafford Foundry of Westinghouse Electric Corp. This foundry is part of the Feeder Division of Westinghouse, and as such makes both gray and alloy iron castings for other divisions of the corporation and, occasionally, for outside purchasers. The castings made vary in weight from small items weighing two or three ounces (Fig. 2) to large turbine base castings (Fig. 3) weighing approximately 80 tons.

When in 1940 it was anticipated that demands for castings would be greater than existing capacity, plans were made to increase the floor area by 30 percent, improve working conditions, and fully utilize the remaining limited floor space by mechanizing the foundry facilities. At that time the handling of foundry materials presented a major problem. Working conditions were far from satisfactory, a particular concern being the dust and smoke conditions resulting from inadequate control systems. Due to these factors there was a growing resistance on the part of new employes to continue on their foundry assignments.

It was recognized that the shortage of foundry labor could not be alleviated until employment in this field was made more attractive in comparison with other available jobs. In addition, mechanization would permit management to break down many of the highly skilled foundry arts to a machine operator basis, thus cutting fatigue and job-learning time. The whole program would also provide an improvement in the general health of employes as well as giving them a means to increase their output and, in consequence, their incentive earnings.

Fig. 7—Car type mold conveyor automatically dumps molds onto apron conveyor. A cam tilts the car toward the slide to the apron conveyor as moving arm simultaneously pushes mold off the car.

The actual steps in improving working conditions and the training program unfortunately do not lend themselves to tabulation, as do the physical changes wrought in the course of modernization. Although taken concurrently, the general approach to personnel problems was more evolutionary in nature. Suffice it to say that training was adapted to the needs just discussed, that technical personnel was added to the working force in line and staff positions as required by mechanization, and that physical improvements were made in worker accommodations such as locker rooms and other conveniences.

Coreroom Modernized

Mechanization as opposed to modernization is more readily described. The first step was a thorough survey of our own foundry and a number of observation trips to other foundries that had already undergone mechanization. After a complete study an overall mechanization program was undertaken which to date has justified the best expectations. This program, now nearing completion, together with some of the problems and their solution, is outlined in the following paragraphs.

The first section of the foundry to be mechanized was the coreroom, for small and medium cores. Approximately 75 tons of silica sand is required daily for the operation of the core room. Efficient handling of such large quantities of sand together with necessary binders required mechanical handling.

The equipment now installed includes a 50-ton under floor hopper for receiving carload lots of silica sand. A conveyor moves the sand to a dryer having a nominal capacity of 6 tons per hr. An elevator and distributing belt delivers the dried sand to the four 100-ton and two 50-ton overhead storage bins. Two weigh lorries (Fig. 4) convey the sand from the overhead bins to the sand mixers, which are equipped with discharge outlets for adding core oil and water to the sand mixture.

Core oil is pumped from a 10,000-gal. underground storage tank and metered at the sand mixers. Similar metering attachments are available for the addition of water. Processed core sand is distributed to the coremaking station on the gound floor in metal containers on an electric truck, or is lifted by means of an electric skip hoist to a sand-distributing platform above the coremaking stations located on the second floor.

Fig. 8—The molds are automatically rammed with sand supplied from the central sand-conditioning system.

From this point one operator, with the aid of 2-wheel dump buggies, is able to furnish core sand to the overhead bins serving the 40 work stations manned by 32 coremakers and eight blow-machine operators. The eight blow machines will handle a range of cores from the smallest to those weighing 300 lb each. The large cores are rolled over and drawn from the core boxes by means of a barrel-type roll-over machine equipped with air-operated clamps and draw cylinder. Both gravity and power-driven conveyors were installed to move the green cores from the coremaking stations to the baking ovens.

Baking and Finishing Cores

Two gas-fired, recirculating, vertical-type ovens (Fig. 5—see front cover) are used to bake the cores, transport them to the first floor for finishing, and return the core dryers to the second floor. The cycle time on these two vertical ovens ranges from 2½ to 3½ hr. The finishing operation on these cores is performed on roller conveyors, and the assembled or washed cores are re-dried in a horizontal paste-drying oven equipped with a power-driven pallet conveyor. Completed cores are transported by roller conveyor to the core storeroom.

Equipment for the production of the large cores include a sandslinger fed by an overhead tank, a 6000-lb roll-over machine, and two 16-ft wide compartment-type gas-fired recirculating core ovens. Each oven holds four 6x4-ft cars. The cars (Fig. 6) are moved to and from these ovens by means of an underfloor power-driven chain, and oven doors operated electrically.

A completely equipped sand control station was installed on the platform adjacent to the two sand-conditioning units. At this control station physical testing is performed for all the sand used throughout the foundry. This station is operated in conjunction with the expanded main laboratory. The main laboratory is equipped for sand testing, sand development, physical testing of the gray iron produced, and all chemical analyses necessary to the foundry operation.

Coremaking Problems Encountered

Quality cores in quantities sufficient to prevent delays and shutdowns must be supplied to mechanized molding units if increased production at reasonable cost is to be realized. Two core problems are immediately encountered; the cores must be dimensionally accurate for ease and speed of core setting, and they must be available when needed. The mechanization program in the coreroom contributes greatly to the solution of the first problem, but experience has proved that gaging and sizing of critical cores are required. Gaging in the coreroom definitely speeds the production of molds in the molding department by insuring that the cores will be satisfactory as received.

The gaging operation itself has created problems in the design of gages which will be easy to use and will accurately check the condition required. Gages which are actively used must be checked at regular intervals to insure the accuracy of the gage. We have attempted to supply metal gages on all active jobs.

To provide sufficient cores as needed for molding departments, core production was scheduled according to the time required for producing them. This advance production of cores necessitated suitable storage facilities prior to molding with the accompanying problems of identification. Storage and positive, quick identification by storeroom attendants presented many difficulties. Our approach, which has been fairly satisfactory, has been to segregate the cores in the storeroom to locations according to the molding section which will ultimately use them.

Molding Floors Mechanized

Molding operations in this foundry are segregated into three major sections. The small castings, ranging up to 200 lb and using flask sizes ranging from 12x14 in. to 22 in. square, are molded in the first section. Medium castings, ranging to 500 lb and using flask sizes from 18x24 in. to 44 in. in diameter, are molded in the second section. The large castings, to 80 tons, are molded in flasks or pits, flask sizes ranging from 4 ft square to 12x16 ft and pits up to 23 ft wide by 70 ft long and 12 ft deep. These molding sections require approximately 300 tons of metal per 24-hr period.

The small molding section is divided into two principal units. The first is composed of eight squeezer stations with overhead sand supply and using maximum flask sizes of 11x18 in., a car-type power mold conveyor, a pouring station, and a shakeout station where the cars (Fig. 7) are tilted automatically, discharging the molds onto an apron conveyor. The second unit, utilizing run-out roller conveyors, serves 19 stations equipped with overhead sand supply.

One set of cope and drag machines uses 22 in. square flasks; a similar set uses 18 in. square flasks; two sets are provided for 15 in. square flasks, five squeezer stations and six bench stations. The use of run-out roller conveyors provides a flexible set-up for pouring, permitting the utilization of all grades of metal at the same time. The molds after pouring are either dumped onto an underfloor conveyor or are placed on a shakeout which discharges onto this same underfloor apron conveyor for delivery to the cleaning floor. Empty flasks are returned to the molding stations by reverse flow gravity conveyors.

The sand, after separation from the castings, is returned on belts to two 80-ton sand storage bins above the central sand-conditioning stations. The sand mixers are equipped with automatic cycle controllers to regulate material additions and mixing cycle. Thus one employe can operate the four 8-ft sand mullers, which serve this molding section and part of the medium casting molding section.

Sand Supply and Distribution

Sand, after mixing, is returned to the 31 molding stations, where the distribution is controlled by one operator. The output per productive man-hour has been increased with these facilities by approximately 50 per cent; and the output per elapsed checkboard hour has been increased by approximately 35 per cent, since the number of service workers with the mechanical equipment is somewhat higher.

Castings falling within the medium range (up to 500 lb) are made on three separate units. All of the molds are rammed by sandslingers (Fig. 8) with sand supplied from central conditioning stations on these units, and mechanical shakeouts are used throughout. One of these units takes 26-in. and 32-in. square flasks on long production runs. The drag molds are rammed with a sandslinger on a four-station indexing machine which

operates on a principle similar to that of a turntable. Empty flasks are placed at the first station. Molds are rammed at the next station and rolled over at the third. Finally, the pattern is drawn and the mold is pushed out on a short section of roller conveyor for finishing and coring.

All of these operations are in a time sequence permitting a high production flow of molds. The copes (Fig. 9) are rammed on a turntable equipped with four push-off machines. Again the empty flask is placed on the first station, the second position being the sandslinger ramming station. The third station is used for striping the mold; and finally the copes are lifted with an electric hoist and placed on the drag, which has been previously pushed onto a roller-top power-driven mold conveyor. The molds are then poured with the use of an overhead crane.

From this point, the molds are conveyed to a twin shakeout position, the first of which is used to remove the sand from the cope flask and the casting from the mold. The second position automatically removes the sand from the drag flask section and returns the empty flasks to the molding station by means of a gravity roller conveyor. The castings, together with any internal cores, are placed in buckets attached to an overhead chain conveyor, which delivers the castings to the cleaning floor, permitting the castings to cool during the time required for transport.

A unit similar to the one previously described, handling identical flasks in addition to flasks 33 and 44 in. in diameter, and equipped with roller-type mold conveyors instead of power conveyor, also is in operation. This unit functions primarily as a short-order setup.

The third unit (Fig. 5) in this department is the most completely mechanized unit at this foundry. It consists of four small roll-over machines for drags and four small stripper machines for copes. The flasks, ranging in size from 18 in. square to 18x36 in., are rammed by sandslinger fed from a rotary-type hopper. This unit produces castings for industrial-type motors in large quantities. The turntable, on which is installed eight patterns (four cope and four drag), is connected to a power-driven car-type mold conveyor with a short section of roller conveyor, used for the core setting and closing station.

After the mold is closed, the entire mold is pushed onto the power conveyor, where it is taken to the pouring station. After pouring and cooling, the mold is again pushed with the use of an air cylinder onto the mechanical shakeout. From this point the castings are

Fig. 9—This photograph shows details of the four-station cope molding machine (see Fig. 8).

delivered to the cleaning floor on an apron conveyor, and the empty flasks are returned to the molding unit on gravity-type roller conveyors. The three units in this medium molding section utilize approximately 150 tons of the 300 tons of metal that is melted during each 24-hr period.

One of the most unique installations in this foundry is the unit designed for producing the large castings, weighing up to 80 tons. In one part of this section the cope and drag flasks from 4 ft. square to 4x6 ft. are rammed with a stationary sandslinger (Fig. 10) and are rolled and drawn on a 20,000-lb roll-over machine. The cores are set, the molds are closed, and the metal is poured with the use of overhead cranes. After pouring the molds are placed on a 4x6-ft shakeout, having a capacity of 10 tons.

Facilities for Large Molds

In another part of this section the largest flasks and pit molds are rammed with a traveling wall-type sandslinger, capable of covering an area 35 ft. wide and approximately 300 ft. long. The pits serviced by this slinger consists of one pit having a total length of 70 ft., another one 50 ft. long, and two smaller pits 18 ft. long. Large cores used in connection with these pit molds are also rammed with the slinger.

A large shakeout, consisting of four 4x6-ft. units and having a maximum capacity of 50 tons for shaking out all of the flask molds and cope flasks, is used in connection with pit molding operation. The molding sand from both shakeouts is returned to a central sand-mixing unit consisting of four 100-ton bins for returned sand, four 8-ft. mullers, and four 50-ton prepared sand bins. The mullers are equipped with automatic cycle controllers so that again only one employe will be required for the operation of this sand-conditioning system.

From the prepared sand bins, sand is delivered by means of belts, the motion and speed of which are controlled by the slinger operator from his seated position on the slingerhead. Prior to the installation of this equipment, the sand used in this section was of the natural bonded type, which has now been changed to a synthetic sand. This section utilizes circulating gas-fired type dryers for surface baking. The amount of molten metal used in this section is approximately 75 tons of the 300 tons melted during each 24-hr period.

In general, the dust-collecting equipment serving the molding units is of the wet type. Handling more than 250,000 cfm these collectors are connected to the sand mullers, shakeouts, screening units, and transfer points in the sand-handling system.

Sand Problems Overcome

Another important factor which had to be considered in the mechanization program was that of supplying carefully controlled sand of the proper characteristics to the machine operators. The use of less skilled employes and the increased productive rate desired made this necessary. In addition, the sand had to have satisfactory shakeout qualities for the mechanical shakeouts; also, for economy, sand losses because of lumpy shakeout and sand retention in castings had to be kept to a minimum. The installation of sand-testing equipment and the organization of a sand-testing staff responsible for sand quality provides the basis for regulating the foundry sand properties.

Operation of the installed equipment created an additional sand problem which had not been previously considered. The air-cleaning system was designed to collect dust at the point of origin and was adjusted for maximum cleaning effect. It was found, however, that this condition resulted in the collection of a large amount of the desirable fines present in the sand; these included the clay bond, the sea coal, and many of the fine sand particles which were necessary for suitable sand characteristics. The dust-collection system was adjusted to reduce the loss of these materials and still maintain adequate dust control.

The completed installation provides a silica sand with uniform moisture content for processing and permits convenient access to the necessary binders in bins adjacent to the sand muller; manual handling of sand was practically eliminated; manual handling of green and finished cores was reduced; and the quality of cores, through control of moisture content of sands, binder additions, and baking conditions, was definitely improved. Dimensional accuracy of cores has been improved, and reduction in breakage has been accomplished through the installation of these mechanized facilities. With essentially the same classes of work, the consumption of core sand per man-hour has been increased by 60 per cent through mechanization.

Metal Melting Department Modernized

For castings larger than 35 tons, metal is obtained from one or both of the two air furnaces, which have a total capacity of 65 tons. One of these air furnaces is heated with pulverized-coal firing equipment, and the other is hand-fired with coal. The melting department is further equipped with two 90-in. and two 84-in. cupolas, which are lined down to 66 and 60 in., respectively. Two of these are connected with a 10-ton pulverized-coal-fired holding furnace.

Charges for the cupolas are prepared with the use of an overhead yard crane equipped with a magnet for placing the metallics into a weigh hopper, from which they are droped into the charging bucket. The bucket is then moved by a transfer car to a position under the coke and limestone bins, where this addition is made from another gravity-fed weigh hopper. The transfer car is then moved under the bridge-type charging crane located adjacent to the cupolas, which places the charge into the cupola. Under normal operating conditions, two cupolas cover the 24 hr of each day in two 12-hr periods; and the other two operate for fluctuating periods dependent upon metal demands in the the molding sections.

The 10-ton holding furnace is used as a reservoir of available metal to maintain a constant supply to the molding units. The cupolas supplying metal to the 10-ton holding furnace are continuously tapped. Two smaller holding furnaces of 6,000 lb capacity each are located near the power conveyor for the squeezer stations in the small molding section, and the cope and drag turntable unit in the medium molding section. Ladles (5,000-lb. capacity) of molten metal are delivered to the pouring station by electric platform trucks, and the larger ladles up to 50,000-lb capacity are transported by overhead cranes.

As previously described, there are three power conveyor units as well as a number of roller conveyor run-out units for which metal had to be supplied as required. Any delays in the delivery of the metal which results in the shutdown of one or more of these units is costly because a large number of employes is involved. The most critical units in this respect are the power conveyor units because of the limited mold storage space available and the large number of employes represented in their operation.

Metal Problems

In addition to the problem of having sufficient metal available when required, various grades of metal are needed by the molding units, as specified by the casting order. Analysis of these problems indicated that a reasonable solution could be obtained by the utilization of the holding furnaces, the assignment of orders to the units best adapted to the order, and the scheduling of metal production.

Metal demands are greatest for the low strength, or ASTM class 20 gray iron, and this metal is supplied 24 hr per day. The cupolas are utilized in this production, so the 10-ton holding furnace was installed as a unit common to these cupolas. The 3-ton holding furnaces were installed adjacent to each of the two high-speed power units in order to provide still greater flexibility and to decrease the number of ladles of metal which must be handled betwen the cupolas and the power units.

The other grades of metal required for production (ASTM classes 30, 40, and 50) are provided by the other two cupolas as indicated by a planned production schedule. Every effort is made to operate the power units on the low strength iron. When this is not possible, all patterns operating on the molding units must specify the same grade of metal, or the molds requiring higher grades of metal must be transferred from the conveyor to some storage area where the special metal can be easily supplied.

Molding Department Problems Encountered

Certain molding problems arise in highly mechanized units in which careful process control produces the most satisfactory solutions. Some of our most critical molding problems with these units have been concerned with pattern equipment and with molding techniques. Minor problems that we have encountered, such as those of insuring mold cleanliness, correct metal-pouring methods on moving conveyors, have been readily solved by a study of the problem and the application of indicated corrective measures.

The importance of pattern equipment in a mechanized unit was recognized early, but some details, which had not been considered, required correction after the units had begun operation. It was found that mechanization demands the best and most foolproof equipment available in flasks, patterns, and coreboxes if satisfactory performance is to be obtained. This arises from the use of less skillful employes, who may not appreciate the importance of details in molding, the severe treatment to which this equipment is subjected in mechanical units, and the productive rate demanded, which does not allow the use of inferior equipment that might slow down the operation.

Fig. 10—Views of the stationary machine used for fast, uniform ramming of medium and large size molds.

Application of the correct molding routines by the machine operator is one of the most important problems involved in a mechanized unit. In most cases, the sand supplied for such a system should be between the most desirable sands for extreme castings encountered. This creates problems in molding methods for some specific castings which must be solved by careful process control.

The molder learns to recognize casting types likely to cause trouble and becomes acquainted with the correct molding technique for those castings. The molder must be kept advised of the casting defects for which he is responsible; and his supervisor, with the technical advice of the control staff, will aid him in solving the unusual problems. With the molding jobs reduced to a machine-operator basis, the new foundry employes soon learn the routine and molding principles.

Finishing Department Facilities Improved

The cleaning and chipping floor has the usual complement of equipment, consisting of a high-pressure water blast for removing cores, two cabinet-type pneumatic blast units, one monorail-type shot blast booth equipped with three airless blast units, two batch-type airless blast units, ten tumbling barrels, and a number of swing and stationary grinders.

Most of the castings produced at this foundry are given a clear varnish finish, a prime paint finish, or a slushing oil finish to protect them from rusting during transit and storage. The varnish finish is applied by dipping and is dried in a steam-heated tunnel oven equipped with a power conveyor. The prime paint finish is applied either by spraying in a completely ventilated paint spray booth, serviced with an overhead crane, or by dipping in suitable tanks, also serviced with an overhead crane.

ALL ROADS LEAD TO

THE 1948 Foundry Congress and Show (52nd annual convention of the American Foundrymen's Association) to be held in Philadelphia, May 3-7, gives every indication of providing the most comprehensive foundrymen's week ever staged. An anticipated record breaking crowd of foundrymen, who will be streaming into Philadelphia by airplane, train and automobile, will note many convention features.

Foundrymen from Maine to California, Florida to Washington, as well as many from abroad, are all eager to see the new and improved products that had not been brought to the display stage since the war's end in time for the Cleveland exhibit. The foundry show will include over 250 individual exhibits, many of these operating and all displaying the latest developments of foundry equipment and supplies.

Continuing scarcities in raw materials and in trained personnel serve to heighten the interest of foundry executives and technologists in North America and abroad in up-to-the-minute data on production and quality control techniques, cost accounting, educational program, inspection, plant mechanization, and job evaluation and time study. The convention technical program, now rapidly approaching completion, will offer general interest, technical, shop course and round table sessions featuring latest practices in high-level quality castings production.

Sessions Start Monday

Beginning Monday, May 3, technical sessions are being scheduled covering general subjects such as job evaluation and time study, plant equipment, foundry refractories and inspection. In addition, each of the major divisions, namely, gray iron, steel, malleable, aluminum and magnesium, brass and bronze, pattern, education and sand, will hold several sessions.

Convention papers will be printed and distributed well in advance of the five-day annual meeting; and it is anticipated that outstanding authorities in various sections of the castings field will contribute written discussions at the convention sessions. The deadline for convention papers has been set for December 15 this year, so that they may be reviewed by general interest committees and division program-papers groups and released for printing by January 15.

Exhibit information, floor plans and space applications were sent out by A.F.A. headquarters in November. Requests for further information on the show should be addressed to Alfred A. Hilbron, Convention and Exhibit Manager, American Foundrymen's Association, 222 W. Adams St., Chicago 6.

All hotel accommodations will be assigned, as in the past several years, by a housing bureau. Applications for rooms are to be mailed early in January. The 1948 A.F.A. housing bureau, to which requests for hotel rooms should be directed,

has headquarters in the offices of the Philadelphia Convention and Visitor's Bureau, 17th and Samson Sts., Philadelphia.

Highlights of the convention will include the A.F.A. Annual Business Meeting which includes the election of National Officers and Directors, Wednesday morning, May 5; the annual banquet, Friday evening; the dinner meeting of officers and directors of the Association's 38 chapters, Tuesday, and the Canadian foundrymen's annual gathering, which this year will be a dinner meeting, Wednesday, rather than the customary luncheon.

A.F.A. gold medals and honorary memberships will be presented at the banquet. First place winners in the national apprentice contest will receive their prizes and certificates at the business meeting.

Charles E. Nelson, technical director of the magnesium division, Dow Chemical Co., Midland, Mich., will deliver the Charles Edgar Hoyt lecture at the Annual Business Meeting. His topic is scheduled as "The Control of Grain Size in Magnesium Castings."

Tuesday has been designated "Philadelphia Day." Local plant men will be admitted without charge and exhibits will remain open from 9 am to 9 pm that evening. Exhibits will be closed at 5:30 pm Monday, Wednesday and Thursday, and at 4:30 pm Friday.

Among the technical program highlights will be a series of five lectures on foundry quality control test procedures, sponsored by A.F.A.'s annual lecture committee. Recommended practices for brass, bronze and nickel alloys; gray iron; aluminum and magnesium; malleable iron, and steel, will be covered.

Gray iron division plans include the popular, informal shop course series, which will comprise four sessions. Two sessions on heat treatment of gray iron and two of general interest will be presented, and it is expected that a progress report on test bar design and method of rigging, by the division test bar committee, will feature one meeting.

The educational division will sponsor three sessions, including its annual business meeting; and the pattern division, a round table and technical papers on metal spraying of patterns and on core box rigging.

Topics under consideration for steel sessions include delayed quenching of steel castings; techniques for quality radiographs, statistical quality controls; core size for knock-off risers, and tensile properties versus composition of normalized cast steel.

A.F.A.'s job evaluation and time study group has scheduled two sessions on the time study of operations in the cleaning room.

Exterior of the United States Mint in Philadelphia.

Exhibitor's Committee Meets In Cleveland

RULES AND regulations for next year's exhibit were formulated by the show management in cooperation with the 1948 exhibitors' committee at a meeting in the Hotel Statler, Cleveland, October 10. A.F.A. Vice-President William B. Wallis, president, Pittsburgh Lectromelt Furnace Corp., Pittsburgh, Pa., presided. W. W. Maloney, Secretary-Treasurer, and Alfred A. Hilbron, Convention and Exhibit Manager, both of the National Office, Chicago, were also present.

View of the Philadelphia City Hall from Benjamin Franklin Parkway.

Representing equipment manufacturers on the committee are C. A. Barnett, president, Foundry Equipment Co., Cleveland; S. H. Hammond, president, Whiting Corp., Harvey, Ill.; W. L. Hartley, Link-Belt Co., Philadelphia; Thomas Kaveny, Jr., president, Herman Pneumatic Machine Co., Pittsburgh; C. V. Nass, vice-president, Beardsley & Piper Co., Chicago, and P. J. Potter, vice-president, Pangborn Corp., Hagerstown, Md.

Committee members representing supply firms who also attended the meeting included: N. J. Dunbeck, vice-president, Eastern Clay Products, Inc., Jackson, Ohio; F. Ray Fleig, president, Smith Facing & Supply Co., Cleveland; J. A. Gitzen, president, Delta Oil Products Co., Milwaukee; L. H. Heyl, vice-president, Federal Foundry Supply Co.; T. G. Johnson, Republic Steel Corp., and E. T. Kindt, president, Kindt-Collins Co., all of Cleveland, and E. H. King, vice-president, Hill & Griffith Co., Cincinnati.

ANTHRACITE AS CUPOLA FUEL

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In this issue, the second and concluding installment of the paper originally presented before the Fifth Annual Anthracite Conference, at Lehigh University, Bethlehem, Pa., May 8, 1947. Part I appeared in the November issue.

A few typical examples, from operations with three different anthracites and coke, have been selected and the data are shown graphically in Figs. 7 and 8. Pertinent information of these tests appears in Table 3.

The melting rate data were estimated on the basis of the volume of metal from each tap and the total checked against the total weight of metal poured. With few exceptions the results check quite closely. The reported melting rate is the rate over the period of normal operation as represented by the straight line portion of the melted metal curve in the graphs.

It would be slightly lower if the first tap were to be included. Temperatures were obtained with a calibrated optical pyrometer, and every effort was made to sight on the true metal surface. The same experienced operator made all the temperature readings and the various data should at least be comparable even though the absolute values may be open to question.

All charges to the cupola were weighed on calibrated scales. The actual metal-coal ratio used was in each case determined by calculation from gas analyses made on the stack gases sampled at frequent intervals at a point a few feet above the charging door. The door was sealed for at least 2 min prior to each sampling. This sampling point was selected because it permitted the installation of mixing vanes in the shaft above the door and ensured more representative sampling. Blast rates were calculated from the speed of the positive displacement blower and the slippage constant at the measured pressures, and were corrected to standard conditions.

As shown previously in Fig. 3, a definite relationship exists between the melting rate, metal temperature, fuel ratio, and blast rate for equilibrium operation. As will be seen from the data on Table 3, equilibrium conditions were not always attained. In a large percentage of the tests it was found that the actual consumption of coal exceeded the weight of coal charged in the splits.

This condition may be attributed in part to the fact that during the melting of the last few metal charges fuel consumption per unit of metal melted is higher than during normal or full-charge conditions. In part, also, this may be due to the fact that the smaller pieces of anthracite produced by size degradation entered into chemical combination with the carbon dioxide before reaching the combustion zone.

Having smaller size, hence, more surface per unit of weight, they would be expected to react faster than would the larger pieces. The weights of fuel reaching the combustion zone would thus be reduced, and as the blast rate was held constant the deficiency in fuel would be made up by burning away the bed. It was observed that in most of the tests where temperature dropped appreciably toward the end of the heat, the data for fuel consumed showed that substantial quantities of the bed charge had been consumed.

Comparing the results for the several coals and coke tested may not be entirely justified because insufficient tests were completed with coals *J* and *S* to be certain that optimum conditions were employed. In general, however, data for the various coals appear to fall fairly well in line. Unfortunately actual fuel consumption data were not secured for many of the early tests which included those on coke and coal *J*. The temperature and melting data for these tests suggest that ratios used were not greatly different from those charged.

Comparative data on typical coke operations in a number of other foundries were secured by the test crew

TABLE 3—CONDITIONS AND RESULTS FOR A FEW SELECTED CUPOLA TESTS AT PROVIDENCE FOUNDRY

Test No.	Fuel	Size	Flux	Bed in.	Blast Rate cfm/ft²	Maximum Windbox Pressure, oz.	Ratio (metal/fuel) Added	Ratio (metal/fuel) Used	Melting Rate lb/min/sq ft	4 Tuyeres Each, in.	Mean Temp., F
51	Coal	Egg	No	22	253	14.0	10/1	10.5/1	19.1	2½ round	2725
68	Coal	Egg	No	24	275	15.9	8.2/1	8.2/1	21.2	4 x 12	2720
42	Coal	Egg	No	22	235	10.0	10/1	9.2/1	17.0	4 x 12	2650
85	Coal	Egg	No	28	275	17.4	10/1	7.5/1	18.4	4 x 12	2680
18	Coal	Egg	Yes	12 Coke 14 Coal J	230	9.2	10/1	——	20.5	4 x 12	2705
19	Coal	Egg	Yes	22	228	8.8	10/1	——	19.1	4 x 12	2680
25	Coke	Egg	Yes	33	236	5.8	10/1	——	20.5	4 x 9	2680
48	Coal	Broken	Yes	22	254	11.0	10/1	10.1/1	19.1	4 x 12	2660

and the results are presented in Table 4. With the exception of foundry C, where 100 per cent steel was being melted, the operations are typical of commercial gray iron foundry practice in this area.

Melting Rates—The melting rates secured during the tests at the Providence foundry ranged from a low of 14.8 to a high of 24 lb per minute per square foot of cupola area at the tuyere level, with the overall average about 19 lb per minute per square foot of cupola area. Such averages, however, fail to give the complete picture since air rates were varied during the same series of tests from 210 to 315 cfm per square foot of cupola area. Using coke the average results were only slightly better, averaging about 20 lb per minute per square foot. For the majority of the tests, air rates were held reasonably close to either 240 or 275 cfm per sq ft.

The data of Table 3 indicates that at the same blast rate and metal-coal ratio the melting rates were not greatly different for the several coals tested. Comparison with the data of Table 4 suggests that the rates for anthracite operations are not appreciably lower than those normally secured in several commercial foundries using coke. Whether the rates could have been increased appreciably with the anthracite by the use of higher blast rates cannot be stated as it was not convenient, due

TABLE 4—OBSERVED RESULTS AT A FEW COMMERCIAL FOUNDRIES USING COKE AS FUEL

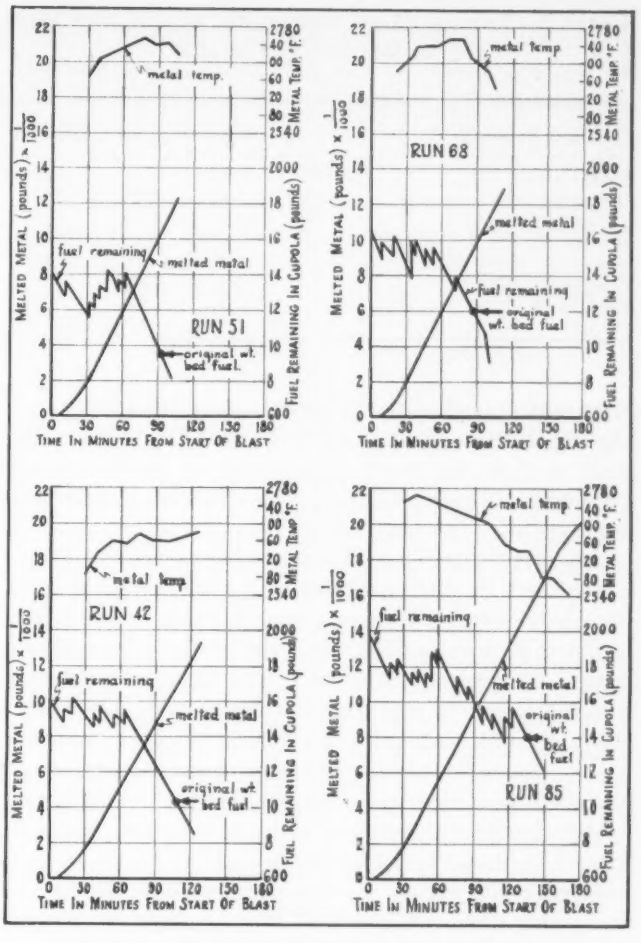
Foundry	Cupola Size, in.	Type of Taps	Ratio (Metal/Fuel)	Melting Rate lb./min/sq ft	Metal Temp., F Average
A	36	Intermittent	7.6/1	20.4	2670
B	50	Intermittent	10/1	18.9	2695
C	36	Intermittent	6/1	11.3	2720
D	52	Intermittent	10/1	21.6	2660
E	72 Boshed to 55	Continuous	9/1	33.8	2790
F	72 Boshed to 55	Continuous	8/1	18.9	2735

to local conditions, to investigate this phase adequately.

Similarly, it was impossible to make tests of several hours' duration, such as employed in many commercial foundries, to determine whether the rates obtained could have been maintained over longer periods. In general, the tests at the Providence foundry were limited to total heats of 15,000 to 18,000 lb of metal with an occasional 20,000-lb heat. Further data on both these points would be of considerable interest.

Metal Temperatures—The metal temperatures reported in Tables 3 and 4 do not include the temperature of the last tap which in many instances was lower than the average of previous taps because of the desire to get the last of the metal out of the cupola. Comparing the results for the several coals and coke shown in Table 3, it would appear that under comparable operating conditions the temperatures were about the same.

Comparing the anthracite test data with results shown in Table 4 for commercial foundries, it will be seen that the anthracite metal temperatures compare favorably with those for coke operations in cupolas employing intermittent tapping even though the metal to fuel ratio for two of the coke operations was lower than in the anthracite tests. In view of these considerations



Figs. 7 and 8—Plotted results of the cupola tests.

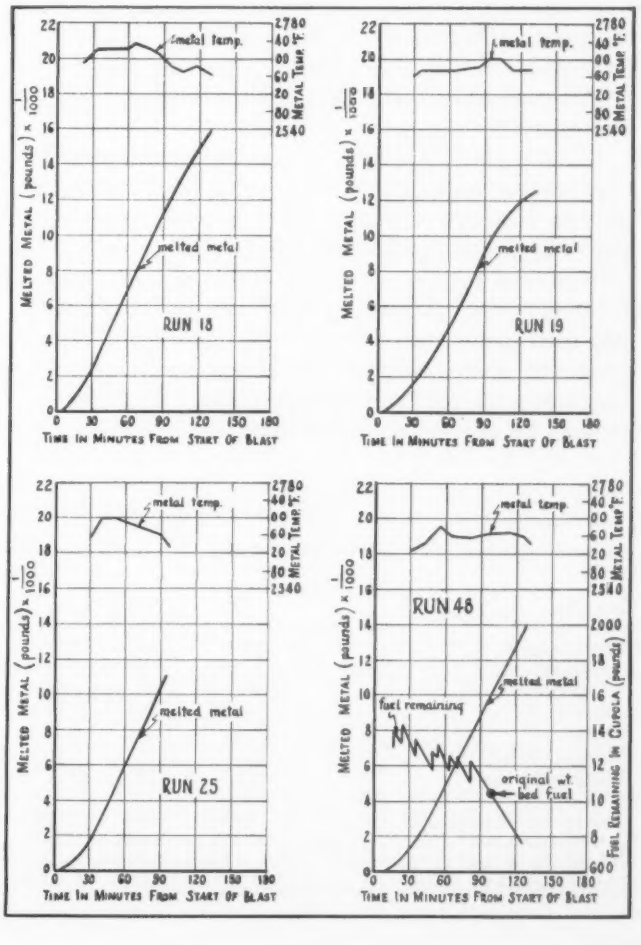


TABLE 5—TYPICAL ANALYSIS OF PIG, SCRAP, AND MINE CAR WHEELS IN CHARGE

Chemical Analysis	Pig	Scrap	Wheels
Total Carbon, %	4.17	3.52	3.71
Graphite, %	3.58	2.81	2.55
Combined C, %	0.59	0.67	1.16
Sulphur, %	0.026	0.093	0.098
Silicon, %	2.01	2.07	0.99
Phosphorus, %	0.05	0.52	0.27
Manganese, %	0.93	0.40	0.84

it would appear that the metal temperatures attained during the tests at the Providence foundry were comparable to those normally attained in similarly operated commercial foundries using coke and were high enough for satisfactory casting.

Metal Quality—Metal quality is, of course, largely influenced by the composition of the original metal charged, and a substantial portion of this charged metal usually is purchased scrap having variable compositions. Fortunately, few foundries have to meet rigid chemical specifications and, as previously mentioned, some do not even sell on physical property specifications. It was deemed advisable, however, to secure both physical and chemical data for the anthracite tests in order that any significant changes resulting from the use of anthracite could be detected. Test bars were poured from one of the taps near the middle of each heat and were subjected to the standard tests.

Throughout most of the series of tests the metal charge was maintained as constant as physically possible. The typical charge of 1000 lb consisted of 200 lb of pig iron, 200-350 lb of mine car wheels, about 250 lb of foundry returns, and the balance purchased scrap. Table 5 shows typical analyses of the components of the charge in the cupola.

For a period of several weeks during the tests, however, it was impossible to secure delivery of pig iron, and the foundry was operated with scrap replacing the pig. During this period the sulphur in the iron gradually increased from an average of 0.11 to a maximum of 0.145 per cent. When pig again became available and was used in the normal quantities, the sulphur contents gradually decreased and were averaging about 0.12 per cent when the tests were discontinued.

Data on the physical and chemical properties of the test bars for the several tests reported in Table 3 are shown in Table 6. Maximum, minimum and average values for the 79 anthracite tests on which data were secured are also included for comparison purposes.

Metal to Fuel Ratios—With but few exceptions all the anthracite tests were made with a constant 10 to 1 metal to coal ratio. The coals varied from 85.5 to 80.0 per cent carbon on the as-fired basis so that the metal to carbon ratios actually charged varied from 11.6/1 to 12.5/1. On the basis of the data shown in Fig. 3, this metal to carbon ratio at the blast rates employed should have melted approximately 26-29 lb of iron per minute per square foot of area, and the temperature of the metal should have been 2600 F. As may be seen from the data of Table 3, melting rates were lower and metal temperatures higher than these figures.

In many of the tests with coal *M* the metal to coal ratios actually used were lower than the ratio charged and, since the metal charges were constant, this indicates that the coal was consumed faster than it was being charged in the splits. Since a definite relationship exists between the blast volume and the burning rate for a given size of fuel, these results suggest that the fuel as actually burned was appreciably smaller in size than as charged.

The results also indicate that a portion of the bed fuel must have been consumed to make up the deficiency of coal reaching the bed from the splits. It should have been possible to counteract this deficiency by increasing the weight of coal charged in the splits, and a few tests were completed with this objective in mind. The tests were not conclusive, however, because the heats were not of sufficient duration to be certain that equilibrium had been established.

Current Use of Anthracite

During the foundry coke shortage of the past year, considerable interest has developed in the use of anthracite as cupola fuel and many foundries have attempted its use to meet part or all of their fuel requirements. The success attained has been variable and largely dependent upon conditions at the particular foundry and upon the anthracite used. Many of the difficulties experienced may be attributed to the general lack of published information available regarding the selection, behavior, and use of large sizes of anthracite.

For foundries beginning the use of anthracite, it will generally be advisable to start by introducing it in the

TABLE 6—CHEMICAL AND PHYSICAL TEST DATA

Test No.	42	51	68	85	18	19	25	48	79 Tests Max.	79 Tests Min.	79 Tests Avg.
Total Carbon, %	3.72	3.87	3.62	3.69	3.59	3.65	3.61	3.72	3.87	3.49	3.61
Graphite, %	2.79	3.08	2.78	2.78	2.57	2.67	2.35	2.84	2.94	2.35	2.66
Combined C, %	0.95	0.79	0.86	0.91	1.02	0.98	1.26	0.88	1.26	0.80	0.95
Sulphur, %	0.094	0.084	0.130	0.111	0.113	0.108	0.101	0.102	0.145	0.090	0.125
Silicon, %	1.31	1.40	1.46	1.30	1.42	1.52	1.55	1.33	1.73	1.11	1.47
Phosphorous, %	0.33	0.31	0.48	0.47	0.45	0.45	0.40	0.35	0.58	0.23	0.41
Manganese, %	0.53	0.50	0.47	0.39	0.45	0.51	0.46	0.51	0.57	0.33	0.44
Transverse Strength, lb	1998	1808	2136	1943	1814	1967	1761	1857	2246	1731	1952
Deflection, in.	0.254	0.249	0.268	0.225	0.262	0.280	0.203	0.256	0.309	0.192	0.254
Brinell Hardness	192	187	207	170	212	270	212	207	250	170	203
Tensile Strength, lb/in.^{2}	27,300	21,300	30,600	29,600	28,000	28,800	27,900	26,500	33,800	21,300	28,860

splits. The recommended procedure is to introduce from 25 to 35 per cent anthracite in the last ten splits and increase the number of anthracite-coke splits in multiples of ten until all the splits contain anthracite.

After experience has been gained in the use of anthracite, and the slagging and blast pressure conditions established for best operation, increase in the percentage of anthracite can be investigated. In general, it will be found advisable to use anthracite at least as large if not larger than the coke which has been found to give the best results in the particular cupola.

In many foundries where anthracite has been tried recently, the foregoing procedure has been employed with reasonable success, although melting rates have sometimes decreased because of the use of egg-size coal instead of the larger sizes. Using the softer structure egg-size coals, a number of foundries have reported successful operation with up to 35 per cent anthracite in the splits. Where blower capacity and operating pressures are adequate no significant change in melting rate, metal temperature or quality of metal has been found.

TABLE 7—EXAMPLES OF CURRENT PERFORMANCE IN LARGE CUPOLAS USING ANTHRACITE

	Foundry A	Foundry B
Size Cupola, in.	54 boshed to 45	72
Size of Coke, in.	Foundry	4 x 3
Size of Anthracite	Egg	Egg & Broken
Type of Anthracite	Soft Structure	Hard Structure
Splits (% Anthracite)	25	50
Fuel Ratio*	5.3/1	9.5/1
Melting Rate, tons/hr.	11–12	20–21
Metal Temperature, F.	2850–2950	2750–2800
Blast Pressure	Increased	Increased slightly
Quality of Metal	No change	No change
Tap	Continuous	Continuous
Type of Casting	Pressure	Centrifugal

* No change from normal practice with coke.

Where the blower is incapable of providing sufficient air at the increased pressure necessary, however, melting rates and/or metal temperatures are reported as lower than with coke. Similar results would undoubtedly be encountered in these same foundries if undersized 3 x 2-in. coke were to be used.

In a few foundries using hard-structure egg or broken-size coals, satisfactory operation has been reported in 56- to 72-in. cupolas with up to 50 per cent anthracite in the splits, and it would appear probable that if larger size anthracite of this quality were readily available an even higher percentage could be used with no detriment to the operation or metal quality.

Two specific examples of current performance using anthracite in the splits are shown in Table 7.

As familiarity with the characteristics and use of anthracite is attained, there appears to be no technical reason why a substantial percentage if not all of the fuel requirements of the cupola cannot be supplied by anthracite, as was the case 50 years ago. More fundamental information on the burning characteristics of the larger sizes of anthracite, the preparation of anthracite correctly sized for this market, and the establishment of definite specifications for anthracite cupola fuel would assist materially in expanding and holding what could be a substantial market for the large size of anthracite coal.

Summary

A series of almost 100 tests on the use of anthracites as cupola fuel have been completed in a 36-in. cupola employing intermittent taps and with heats ranging up to 10 tons of metal. Conditions for the optimum performance with one egg-size anthracite were studied extensively, and several tests made with other anthracites of egg and broken size.

Melting rates, metal temperatures, blast rates, fuel ratios as charged and actually used, and physical and chemical data on the test bars are reported for a number of selected tests. Comparative data for coke operations in the same cupola under the same operating conditions and for coke operations in other commercial foundries are also reported.

For the type operation and quality of metal desired at the foundry where the tests were performed, the anthracite operation was entirely satisfactory and the percentage of rejects quite low. It was found that anthracites vary appreciably in their behavior as cupola fuel, and that the optimum conditions for one are not necessarily the same as for another. More specific and detailed standards for anthracite cupola fuel would be of definite value to the foundry industry.

Acknowledgments

The author wishes to acknowledge with thanks the important contributions to this project rendered by G. M. Bretz and K. M. Barclay who performed most of the actual test work on cupola operation herein reported; the assistance of J. W. Eckerd and C. D. Neubling who performed all the physical and chemical tests on the materials; and the helpful comments and suggestions from co-workers of the staff of the Division of Fuel Technology and The Division of Metallurgy.

The experimental portion of this project was made possible through funds provided by the General Assemblies of the Commonwealth of Pennsylvania for research on new or improved uses for anthracite and bituminous coal, and was conducted under the administration of Richard Maize, Secretary of Mines of the Commonwealth of Pennsylvania.

Appreciation and thanks are extended to the Hudson Coal Co. for permission to use the cupola at the Providence foundry, and to J. Stewart, foundry superintendent, and to his staff for their cooperation and helpful assistance during the course of the test work.

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STEEL CASTINGS
Uses as Engineering Materials

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Presented at the Semi-Annual Meeting of ASTM at Chicago, June 16-19, 1947, this paper cites a number of instances in which steel castings have been or could be successfully used. The advantages of the use of castings from an engineering and economic point of view are emphasized.

ENGINEERS HAVE BECOME QUITE CONVERSANT with the use of steel as an engineering material. Steel may be formed for use by rolling, forging, casting, powder metallurgy or joining together components made by the previously mentioned methods. The selection of the most suitable of the foregoing forming means is dependent on performance and economic considerations as well as the peculiar advantages of some of the methods for making certain classes of products. Constant improvement in each of these forming arts presents the engineer with increasingly effective and varied means for executing structural designs.

This paper will review a few applications of steel castings with the intention of illustrating the wide range of uses for which steel castings have been or can be employed to advantage. By thus becoming more fully acquainted with the possibilities of steel castings, the engineer widens his field for selection of structural materials.

The casting of steel is inherently a versatile and highly flexible medium for making high strength structural components. Steel castings have been made ranging in weight from a fraction of an ounce to over 200 tons. The ease of forming steel by casting allows the designer more freedom to effectively and attractively employ metal than virtually any other forming method.

Steel castings are produced in a manner dependent on the design of the casting desired. There are two general methods for casting steel—the static and the centrifugal. As might be deduced from the name, the static method involves the pouring of molten metal into a stationary mold. The centrifugal method utilizes rotation of the mold to move the molten metal into place and hold it there during solidification. Although centrifugal casting of steel had been done commercially in this country since shortly after 1900, it was not until the late war that it was extensively employed.

Some casting designs can be produced in equivalent quality by either method, economic considerations thus being the governing factor in selecting the method.

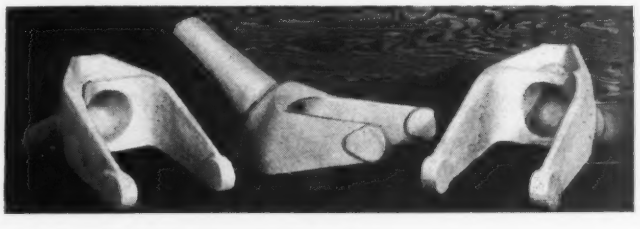


Fig. 1—Tail wheel castor fork castings for aircraft use. Each casting weighs approximately 43 lb.

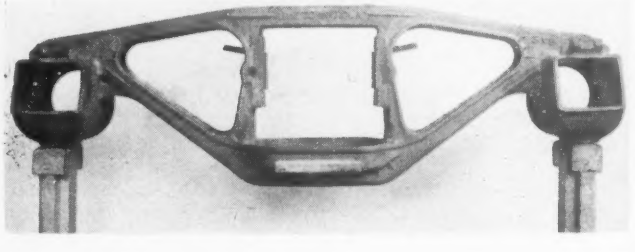


Fig. 2—Four wheel truck integral box high tensile side frame casting, 460 lb total weight. This design is for use on 40-ton capacity cars.

TABLE 1—CHEMICAL COMPOSITION AND HEAT TREATMENT OF STEELS USED TO MAKE STATIC CASTINGS DISCUSSED

Item No.	Composition, per cent C	Mn	Si	Cr	Ni	Mo	Heat Treatment
1. Tail Wheel Fork	0.25	0.75	0.50	1.30	2.75	0.25	1650 F—air cool 1550 F—oil quenched 1050 F—air cool
2. Side Frame Bolster Coupler Draft Gear	0.31	1.65	0.45	—	—	—	1650 F—air cool 1050 F—air cool
3. Friction Shoe	0.46	1.00	0.45	—	—	—	1650 F—air cool
4. Gun Mount Gun Slide	0.28	0.75	0.45	—	—	—	1650 F—air cool 1175 F—furnace cool to 700 F

NOTE: All chemical compositions shown are the desired compositions.

However, some designs, particularly high strength, tube-like castings can be produced centrifugally at such quality and cost levels that the static casting method is eliminated from consideration.

Some engineers have gained the impression that the use of centrifugal force in making a casting, regardless of its design, automatically confers on it qualities unobtainable by the use of the static method. This is not so, since selection of an unsuitable design for casting by the centrifugal method will result in obtaining a casting of poor quality. It should be remembered that the centrifugal and static methods are but different means for making steel castings and, when properly employed on designs suitable to the method in question, good steel castings will result. The casting examples shown in this paper are grouped in two general classifications:

1. Those made by the static method.
2. Those made by the centrifugal method.

Castings Produced by the Static Method

Figure 1, shows a group of tail wheel castor fork castings of one such design made for aircraft use. A feature of the design shown is the elimination of excess weight at points where metal does not contribute to the strength of the casting in the service for which it is intended. The chemical composition, heat treatment and minimum expected physical properties of the steel used to make these forks are shown as item No. 1 in Tables 1 and 2. All castings were required to pass a gamma ray and dry magnetic particle test before being shipped to the customer for machining. After final machining at the customer's plant the castings were required to pass a wet magnetic particle test.

Acceptance of these parts as steel castings was based on the results of tests performed on completed tail wheel assemblies. The tests were such as to simulate the stresses actually encountered in service on an airplane. Steel castings gave an acceptable performance in both testing and service.

Shown in Fig. 2 is a view of a four wheel railway freight car truck side frame casting. The design shown is one of those approved by the Association of American Railroads for use in general interchange service.

The nominal section thickness of this casting design is 13/32 in. The one-piece casting as shown is ready for use, no machining being necessary. The acceptance of new casting designs for freight car use is dependent on the satisfactory performance of complete test castings in static and dynamic tests. Acceptance specifications are based on certain maximum deflections under static loads in the transverse and vertical direction.

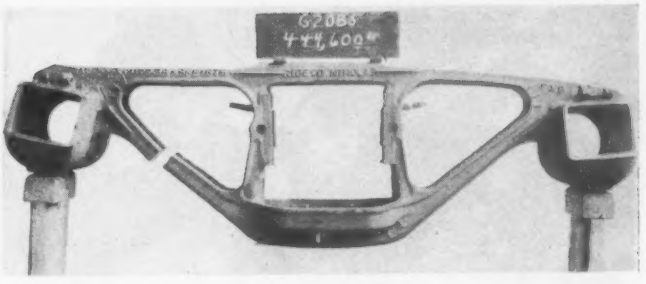


Fig. 3—A four wheel truck integral box side frame casting after having been loaded to failure in a static test. Ultimate strength was 444,600 lb. The design shown is the same as that of Fig. 2.

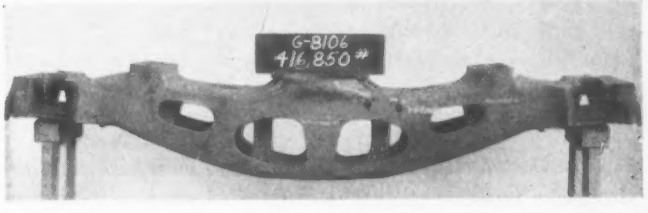


Fig. 4—Four wheel truck high tensile design bolster casting for use on 40-ton capacity cars after being loaded to destruction in a static test. Casting weight —604 lb; ultimate strength—416,850 lb.

Further static specifications include a minimum elastic limit and ultimate load carrying capacity. Table 3 shows the results of such tests on a casting of the design shown in Fig. 2. The nominal chemical composition, heat treatment and minimum expected physical properties of the steel used to make this casting are shown as item No. 2 in Tables 1 and 2. Fig. 3 shows a casting after having been loaded to destruction in this test. It is to be noted that high rigidity and load bearing capacity for such a light weight structural member have been obtained. The castings shown in Figs. 2 and 3 are made of Grade "C" steel.

Dynamic acceptance tests are made in a machine designed specifically for testing these castings in a manner which simulates actual service conditions. The casting is supported at the journal boxes and three different types of loads are applied in sequence until a critical crack is started.

TABLE 2—MINIMUM EXPECTED PHYSICAL PROPERTIES FOR STEELS AND HEAT TREATMENTS SHOWN IN TABLE 1.

Item No.	Ultimate Tensile Strength, psi	Yield Strength, psi	Elongation in 2 in., per cent	Reduction of Area, per cent	Cold Bend
1. Tail Wheel Fork	150,000	135,000	10	20	—
2. Side Frame Bolster Coupler Draft Gear	90,000	60,000	22	45	—
3. Friction Shoe	95,000	55,000	14	25	—
4. Gun Mount Gun Slide	60,000	30,000	24	36	120°

NOTE: The properties of the steels used for the side frame, bolster and coupler were measured on coupons attached to the actual castings. All other results shown were measured on coupons taken from separately cast keel block castings.

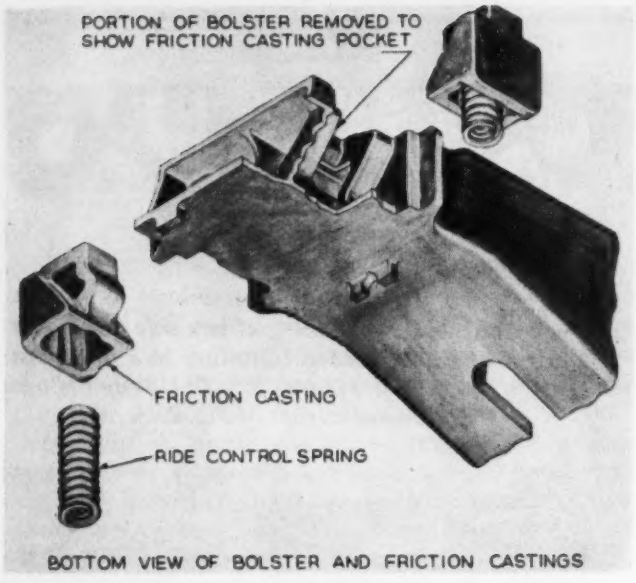

PORTION OF BOLSTER REMOVED TO SHOW FRICTION CASTING POCKET
FRICTION CASTING
RIDE CONTROL SPRING
BOTTOM VIEW OF BOLSTER AND FRICTION CASTINGS

Fig. 5—Sketch illustrating the manner in which friction shoes are positioned in the bolster to exert a frictional force between bolster and side frame.

The direction and magnitude of the loads applied in a single revolution of the main load cam of this testing machine are as follows:

A vertical load equal to 250 per cent of axle capacity is applied to the spring seat of the side frame. While this load is held on the frame, a twist load is also applied to the spring seat, which equals 21.3 per cent of the axle capacity. While both the vertical load and the twist load are maintained on the frame, a transverse load representing 32.5 per cent of axle capacity is applied in one direction to the side frame columns, released and then applied in the opposite direction, and again the transverse load is released.

With the final release of the transverse load, the vertical and twist loads are also removed. On the next half-revolution of the main load cam the vertical load is applied, as mentioned previously, the twist load is applied in the opposite direction, and the transverse load is applied in both directions. The above cycle is repeated 50 times per minute. For the particular design shown in Fig. 2 the vertical load is 75,000 lb, the transverse load 10,500 lb and the twist load 6,800 lb.

TABLE 3—RESULTS OF STATIC DEFLECTION AND STRENGTH TESTS ON 40-TON CAPACITY HIGH TENSILE DESIGN FOUR WHEEL TRUCK SIDE FRAME CASTING (FIG. 3)

Transverse Loading *	
Deflection at 19,200-lb load, in.	0.0755
Permanent set at 38,400-lb load, in.	0.0083
Vertical Loading **	
Deflection at 72,000-lb load, in.	0.0433
Permanent set at 144,000-lb load, in.	0.0005
Elastic limit, lb	246,000
Ultimate load, lb	444,000

* This transverse load was applied across the vertical columns at the center of the casting while the casting was supported at the two journal boxes.

** Vertical loads were applied to the bottom of the spring seat while the casting was being supported through the journal boxes as it woud be in service.

The A.A.R. dynamic test requirements for new side frame designs are as follows:

Start of a Critical Crack	Loadings	
	Grade B	Grade C
No specimen shall show a value lower than	50,000	75,000
Average for four specimens shall show not less than	100,000	125,000

Rules for defining a critical crack are:

(1) Any transverse crack in a tension member even though it may not progress during the test.

(2) Any transverse crack in a compression member or column which progresses during the test.

(3) Any longitudinal crack which joins with another crack to produce failure.

(4) Any crack which, if discovered in service, would lead to removal of frame from the truck.

Naturally, all modern designs meet these dynamic test requirements with a substantial margin. In some instances where tests have been prolonged for development or information purposes, fatigue life in excess of 500,000 loadings has been recorded.

That the excellent performance of these castings in the previously described tests is a good indication of service performance in these parts is borne out by the excellent service of integral cast steel side frames on American railroads. Side frame failures are a rarity and such castings normally outlast the car bodies under which they are placed. When side frames are finally discarded, design obsolescence is the usual reason.

The four wheel railway freight car truck cast steel bolster is a companion casting to the side frame just described, a bolster and two side frames forming the main structural components of the conventional four wheel freight car truck. Acceptance of bolster designs is based on static deflection and load tests. Table 4 gives the results obtained in one such static acceptance test. Figure 4 shows the casting after having been loaded to destruction. The nominal section thickness of this casting design is ½-in. Item No. 2 in Tables 1 and 2 gives the chemical composition, heat treatment and minimum expected physical properties of the steel used to make such castings.

One-Piece Steel Castings

As in the case of the side frame, a strong rigid lightweight part has resulted from the engineer's ability to economically place structural members at the most effective location. This casting is made in one piece and placed in service without the necessity for performing any machining operations. Such castings have an excellent service record on American railroads.

Aside from their excellent performance as structural components, the side frame and bolster designs just shown indicate forcefully the saving in fabrication cost and weight possible with the use of a suitably designed one-piece casting. The duplication of the properties of these castings without an increase in weight and cost by any other method has proved to be an exceedingly difficult undertaking.

A rather unique application for steel castings is that of a so-called friction shoe in a special design of railway freight car truck. By exerting a constant frictional force between the side frames and bolster, friction shoes damp out the vibrating action of the coil springs which serve to support the bolster in the side frames. This

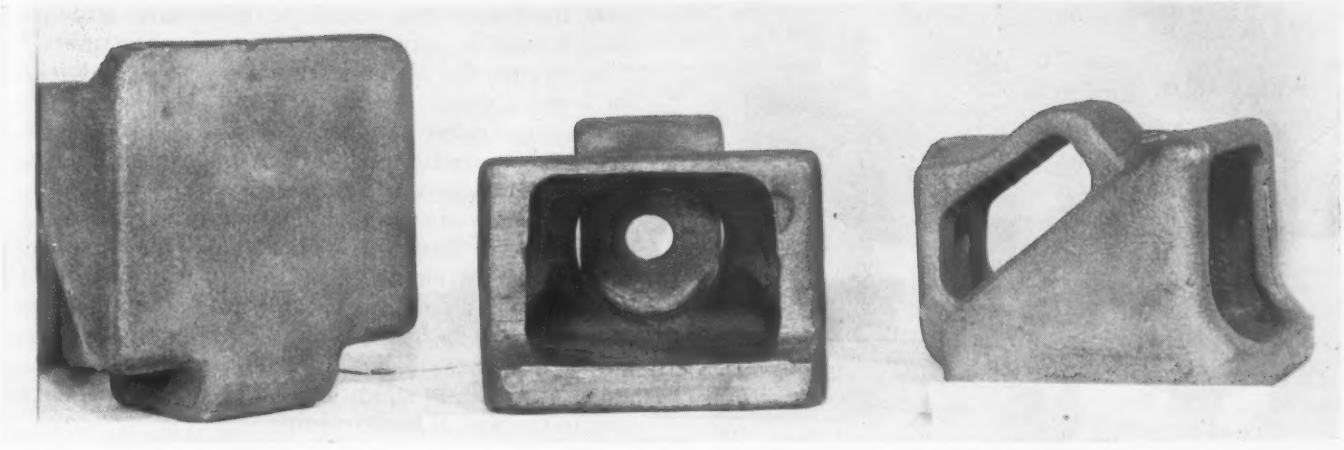


Fig. 6—Cast steel friction shoe castings. The flat faces of the castings are flame hardened to a minimum hardness of Rockwell "C" 52. Casting weight, 12 lb.

damping action assures a smoother riding car. Figure 5 shows a sketch illustrating the manner in which the friction shoes are used.

When the friction castings and springs are placed in the pockets shown and the end of the bolster threaded through the bolster opening of a side frame, the upward force of the spring is translated by the angled surfaces of the friction casting and bolster into a force perpendicular to the flat face of the friction casting. Thus the flat face of the friction shoe is pushed against a flat spring steel plate welded to the side of the bolster opening of the side frame.

Figure 6 shows such castings ready for use. The flat friction face of the casting is ½-in. thick and the remainder of the casting varies in section thickness from $\frac{5}{16}$-in. to ½-in. The chemical composition, heat treatment and minimum expected physical properties of the steel used to make these castings are shown as item No. 3 in Tables 1 and 2. Following the heat treatment shown in Table 1 the flat wearing faces of the shoes are differentially hardened to a hardness of Rockwell "C" 52 for a minimum depth of ⅛-in. The hardness is not less than Rockwell "C" 47 at a depth of $\frac{3}{16}$-in. and decreases to not more than Rockwell "C" 37 at the back of the ½-in. thick wearing face.

The wear resistance of the hardened steel face was determined by testing actual castings in a machine which simulated actual operational wear conditions. The results of these tests and the examination of castings which have undergone actual service indicate that satisfactory wear resistance has been obtained. It is thus seen that the use of cast steel has made possible a product which combines high wearing hardness and wear resistance with an overall ability to resist impact stresses encountered in operating service.

Service Requirements Determine Material

This instance is not cited as a recommendation that selectively hardened medium carbon steel castings be used indiscriminately to replace other wear resistant materials, since where wear resistance alone is required, other materials might give excellent service with a possible saving in initial cost. When both wear resistance and high impact strength are necessary, selectively hardened steel castings are clearly the logical choice.

One of the outstanding achievements of the steel foundry industry is the A.A.R. standard type "E" railway car coupler. Figure 7 shows a view of such a coupler. The principal parts making up this coupler are the coupler body weighing 235 lb, the knuckle weighing 76 lb and the lock weighing 15 lb, all of which are steel castings. Four other parts are forgings and malleable castings totaling 19 lb. Total weight of the assembled unit is 345 lb. The coupler body and knuckle casting shown were made of steel having a chemical composition, heat treatment and physical properties as shown in item No. 2 of Tables 1 and 2.

Couplers made of plain carbon steel are also used. Such couplers are designed to withstand the same pulling force as are couplers of the high tensile design shown in the foregoing. The weight of such a plain carbon steel coupler is 445 lb. These couplers are tested in a static pulling machine to determine their ultimate strength. The average ultimate strength of four high tensile knuckles in one representative test was 597,700 lb, and of four coupler bodies 727,400 lb.

This latter strength was obtained by substituting a special knuckle which has been quenched and tempered to a tensile strength sufficient to produce failure of the coupler body. It will be noted that the ultimate

TABLE 4—RESULTS OF STATIC DEFLECTION AND STRENGTH TESTS ON 40-TON CAPACITY HIGH TENSILE DESIGN FOUR WHEEL TRUCK SIDE BOLSTER CASTING (FIG. 4)

Transverse Loading *	
Deflection at 62,000-lb load, in.	0.0785
Permanent set at 120,000-lb load, in.	0.0045
Vertical—Side Bearing Loading **	
Deflection at 93,000-lb load, in.	0.0483
Permanent set at 155,000-lb load, in.	0.0023
Vertical—Center Plate Loading †	
Deflection at 93,000-lb load, in.	0.0838
Permanent set at 186,000-lb load, in.	0.0028
Elastic limit, lb	258,000
Ultimate load, lb	416,850

* Transverse load was applied to the center of the side of the bolster while it was supported on ends of the casting. The direction of the force was perpendicular to that in Fig. 4.

**Vertical—Side bearing loading was applied to blocks in the raised rectangular boxes on either end of the top of the bolster while it was supported in the position shown in Fig. 4.

† Vertical—Center plate loading was applied to the recess at the top, center of the bolster while it was supported in the position shown in Fig. 4.

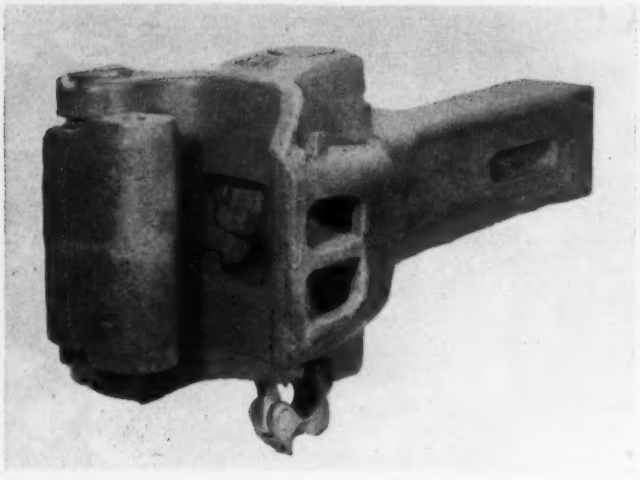


Fig. 7—A.A.R. standard 'E" coupler for railway use. Total weight of assembly shown, 345 lb.

strength of the knuckles was over 100,000 lb less than that of the coupler bodies. This margin is sufficient to insure that under excessive loading, failure will occur in the knuckle, and the coupler can be quickly repaired by application of a new knuckle.

These couplers are a pointed illustration of the versatility of the steel casting process. The intricate contours and recesses of the knuckle, lock and coupler body are all cast to final shape. The pinholes and slots for assembly are cast to final size. Yet these cast parts are assembled into a reliably working mechanical unit which has the pulling strength as shown, and which must withstand the abuse of heavy impacts in railroad use. Further, parts for these couplers are cast by five foundries in the United States and two in Canada to such tolerances that complete interchangeability of parts is possible between the various manufacturers.

As to cost, the assembled coupler can be purchased for a price which is nominally the total price of the castings and other parts of which it is composed. The long and successful performance of cast steel railway couplers on American railroads is proof of reliability.

Draft gears are products closely allied to railway couplers. The function of a draft gear on a railway car is to absorb the energy of impact when two cars strike one another in coupling or switching operations. Requirements of such service are that the draft gear have a low initial cost, give reliable performance under abusive operating conditions and require little or no care in the way of maintenance.

Figure 8 shows a draft gear design which combines coil spring action and the friction of steel against steel to absorb impact. This photograph shows the draft gear in place in a coupler and yoke assembly. The draft gear assembly consists of four steel friction castings, two coil springs, one spring rod, two spring nuts and two cotter pins. The only machining operations required are those of threading the spring rod and spring nuts. Item No. 2 of Tables 1 and 2 lists the composition, heat treatment and minimum expected physical properties of steel for friction castings.

Five draft gears of this design were given a complete laboratory test, using a 27,000-lb drop test hammer, to determine the average gear solid capacity and approxi-

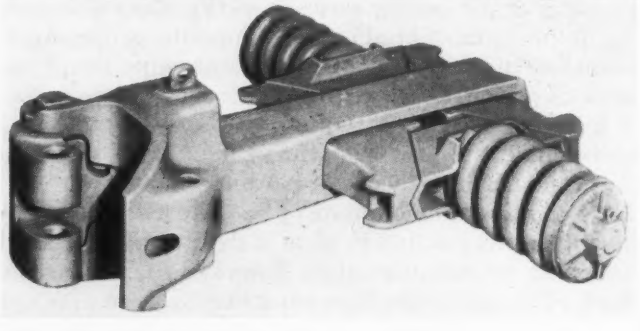


Fig. 8—Railway draft gear made of castings and coil springs. The gear has been applied in the yoke of a coupler. Weight of draft gear, 314 lb. Weight of coupler and yoke, 340 lb.

TABLE 5—CHEMICAL COMPOSITION, HEAT TREATMENT AND PHYSICAL PROPERTIES OF TWO CENTRIFUGALLY CAST TUBES
(Dimensions of tubes before quenching treatments: 6¾-in. O.D.; 7¾-in. length; ¾-in. wall thickness)

Type of Steel	Heat No.	Chemical Composition, per cent C	Mn	Si	P	S	Cr	Mo	Ni	Special Deoxidation
SAE 4140	3673	0.43	0.87	0.42	0.014	0.028	0.93	0.22	—	5 lb high carbon ferrotitanium per ton
N. E. 8740....	3674	0.41	0.93	0.45	0.019	0.029	0.57	0.26	0.55	

Heat Treatment

1650 F—2 hr—air cool
1250 F—2 hr—air cool
1575 F—1 hr—oil quench
900 F—2 hr—air cool

Type of Steel	Heat No.	Physical Properties: Ultimate Tensile Strength, psi	Yield Strength, psi	Elongation in 2 in., per cent	Reduction of Area, per cent	Brinell Hardness No.	Izod Impact ft-lb	Cold Bend
SAE 4140	3673	179,167	170,833	11.2	35.1	375	13	51°
N. E. 8740	3674	177,167	169,500	12.5	32.8	375	14	56°

NOTE: Each Izod value is the average of six tests. All other values are the average of three tests. Tensile tests specimens were standard 0.505-in. diameter. The cold bend tests were made on specimens ¼x¾x7¾ in.

TABLE 6—PHYSICAL PROPERTIES OF FORGED AND CENTRIFUGALLY CAST ENGINE MOUNTING BEARER TUBE
(from the work of Smith and Morris [2])

Method of Manufacture	Type of Steel	Heat Treatment	Yield Strength, psi	Ultimate Tensile Strength, psi	Elongation in 2 in., per cent	Reduction of Area, per cent
Forging	SAE 4340	1625 F—1 hr, oil quench 950 F—2 hr, air cool	177,425 *	186,425 *	24.3 *	51.9 *
Casting	SAE 4140	1625 F—2 hr, oil quench 1100 F—2 hr, air cool	152,625 **	166,450 **	12.0 **	42.0 **

* Denotes tensile coupons were heat treated as 1x1x8-in. bars cut from a forged fitting. Tensile tests were made on sub-standard test specimens having 1-in. gage length and 3/16-in. gage diameter.

** Denotes substandard test specimens having 1-in. gage length and 3/16-in. gage diameter were cut from the walls of the heat treated casting.

NOTE: All physical properties are the average of the results from four test specimens.

mate ultimate life. The average gear capacity was 15,000 ft-lb and the life was so far beyond what was originally anticipated that the test was finally discontinued after an average of 211,876,060 ft-lb of energy had been delivered to each of the five gears.

Initially, it was decided that where the gear solid capacity would be reduced by wear of the steel castings to 13,500 ft-lb, adjustment of the coil springs would be made to bring the gear capacity back to its original figure and the test continued. The assemblies averaged 118,882,920 ft-lb energy delivered before the solid capacity dropped to 13,500 ft-lb, and adjustment of the springs was necessary. Measurements of the frictional parts taken after the test indicated that a total of 400,000,000 ft-lb input per gear could have been reached with the gear remaining in satisfactory condition.

The description of the foregoing draft gear and its performance is not given with the intention of proving that it is the most suitable design available for such products. Draft gears of many designs are in successful use on American railroads. Most of these designs are in a large measure dependent on steel castings for vital parts. The design mentioned is cited as a demonstration of the ease with which the steel casting process can economically produce such products.

Steel Castings for Ordnance

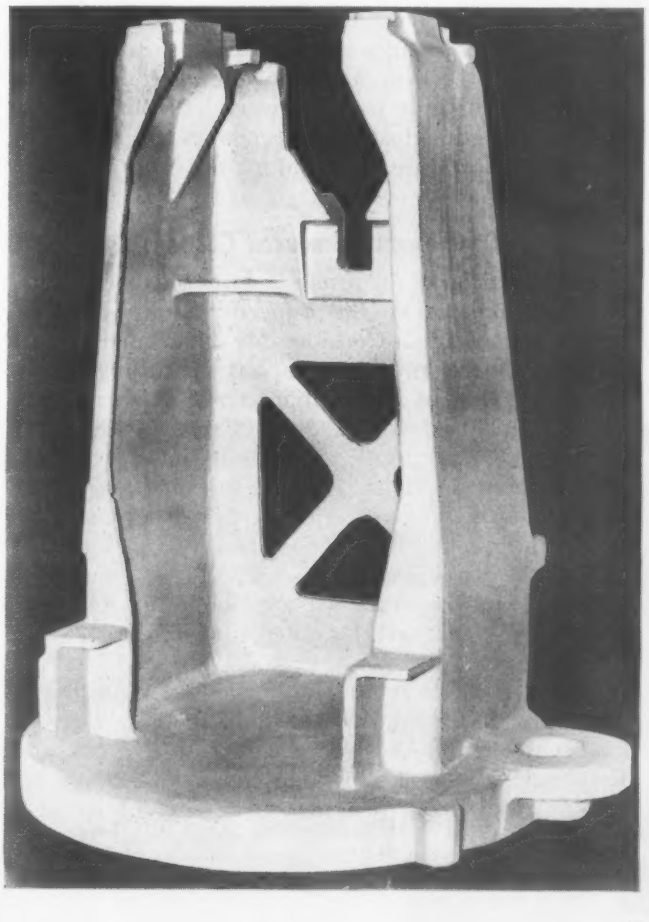
During the war the steel casting industry was called on to produce cast armor for tanks and other armed vehicles. Countless structural castings for ordnance materiel were also made. One instance will be cited from this experience which demonstrates the simplicity which the casting process can introduce into the manufacture of a complicated part.

Figure 9 shows a combination carriage and base ring for the 3-in., 50-caliber Mark XXIV antiaircraft gun ready for machining. This one-piece casting was designed to replace a welded and bolted assembly made up of 40 pieces. The casting shown weighs 2,000 lb. When machined this casting weighed 169 lb less than did the machined comparison fabricated assembly it was designed to replace. Item No. 4 in Tables 1 and 2 gives the composition, heat treatment and minimum physical properties of the steel used for this casting.

A companion casting to the gun mount shown in Fig. 9 is the gun slide, which is shown prior to machining in Fig. 10. This one-piece casting replaced a fabricated assembly made from 20 pieces. The steel and heat treatment used to make this casting were the same as used for the carriage casting (Fig. 9). Both castings were required to successfully withstand proof testing before acceptance of the cast steel construction.

The possibility for simplification of production and a saving of cost seem obvious in these instances, especially when it is considered that all welds were required to be dressed down and radiographically inspected. The foregoing examples are not given to

Fig. 9—Combination carriage and base ring for 3-in., 50-caliber Mark XXIV antiaircraft gun made as a one-piece steel casting. Weight of casting, 2,000 lb.



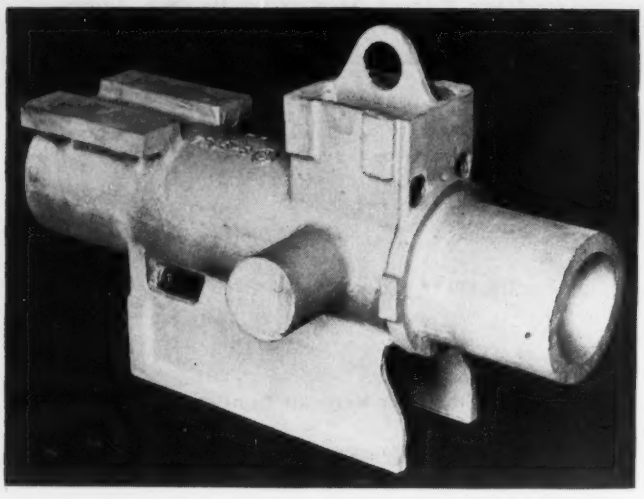


Fig. 10—One-piece cast steel gun slide for use with gun carriage shown in Fig. 9. Casting weight, 822 lb.

emphatically claim that one-piece steel castings are the solution to every problem. For that matter neither are the other methods for forming steel. However, it is felt that such examples suggest possibilities for the simplification of design and lowering of cost possible with cast steel construction.

In considering the use of cast steel construction it is to the advantage of the designing engineer to consult with the foundryman before completing final designs. In this manner the greatest possible gain can result from the use of the casting process. Virtually any method of fabrication is at its best if the engineer had it in mind when designing the structure under construction. Steel castings are no exception to this rule. Cast steel construction can serve well under design conditions for which it was not intended, but it serves best when the designing engineer takes full advantage of its particular abilities in making the original design.

Centrifugally Produced Castings

An illustration of the results obtainable by the true * centrifugal method are the properties obtained in short length tube castings. Considerable experimental work was done by the author's company on tubing 7¾ in. long and having an outside diameter of 6¾ in. The as-cast wall thickness of such castings was approximately 1¼ in. These castings were made in a cast iron mold rotated about a vertical axis. Table 5 shows typical results obtained from various types of physical test specimens removed from the walls of two such castings after the heat treatments shown had been given.

Steel compositions shown are nominally SAE 4140 and N.E. 8740. It will be noted that tensile strengths in excess of 177,000 psi have been obtained. Even at this strength level relatively good elongation and reduction of area values are lower than those obtained on specimens removed from the direction of hot work in forged tubing of the same chemical analysis and

* The term "true" centrifugal casting means that the casting is spun about its own axis and that the internal diameter is formed by centrifugal force alone.

tensile strength. However, the work of Sims [1] has indicated that such a comparison is incomplete and possibly misleading.

Sims' study concerned itself with a comparison of forged and centrifugally cast cylinder barrels for radial aircraft engines. Tensile and fatigue test specimens were removed from both castings and forgings in the longitudinal and transverse directions. The castings

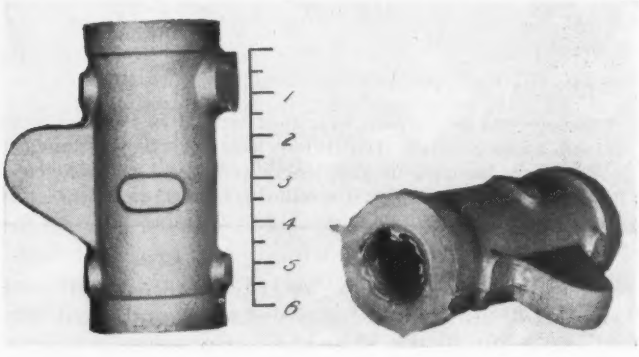


Fig. 11 (right)—Engine mount bearer tube fittings cast by true centrifugal method. Casting weight, 10½ lb.

had equal properties in the two directions. The forgings had higher elongation and reduction of area values in the longitudinal direction, but were inferior to the castings when results in the transverse direction were compared. The average of the transverse and longitudinal specimens from the forgings were equal to those of the castings.

From these tests Sims concluded that the principal difference between the two products was that the forgings had directional properties which were absent in the castings. Fatigue test specimens from the two types of materials showed such similar behavior that no superiority could be shown for either.

The centrifugal casting process has demonstrated its worth in the manufacture of aircraft cylinder barrels, high explosive gun tubes, high alloy tubing and other related products. It would seem that the process could serve other useful purposes, one of which might be the furnishing of small quantities of short length, relatively heavy walled tubing of special analyses.

It was found during the war that tubelike casting designs need not be perfectly symmetrical about a single axis to be made successfully by the centrifugal method. Figure 11 shows centrifugally cast engine mount bearer tube fittings of a design used on the Curtiss-Wright P-40 airplane.

Experimental Castings

These castings were produced experimentally by the author's company and submitted to the airplane manufacturer's research laboratory for tests to determine whether or not they could be used to successfuly replace forged parts of this design. Smith and Morris [2] reported the results of these tests. Table 6 summarizes the results they obtained from tensile test specimens.

It will be noted that the higher hardenability of the SAE 4340 steel used for the forging as compared with the SAE 4140 steel used for the castings and a difference in heat treatment resulted in the forging having a tensile strength 20,000 psi greater than that of the casting. This difference reacted to the disad-

(*Concluded on Page 59*)

FOUNDRY LABORATORY PART OF HARVESTER RESEARCH CENTER

INTERNATIONAL Harvester Co., Chicago, in an endeavor to develop improved manufacturing techniques is segregating its manufacturing research from other numerous Harvester operations.

The manufacturing research department will be located at 5225 So. Western Avenue, Chicago, and has been in the process of being established for more than a year. Housed in a 230,000 sq. ft. building acquired from the federal government, the Harvester company has expended three and one half million dollars in buying and equipping the building. The department was officially dedicated on October 21 by Fowler McCormick and John L. McCaffery, chairman of the board and president, respectively.

Objectives of this department are: (1) the investigation of the company manufacturing methods and problems, (2) development of manufacturing standards, and (3) keeping abreast of all developments in the manufacturing world.

The research department also shares other general objectives of the Harvester company which include: increasing the utility of products, improving quality of products, developing new processes, materials and products, reducing product cost as well as operating and maintenance costs, standardizing methods, collecting technical information, and contributing to the general store of technical knowledge.

Administration of the new unit and research activities in the department are under the direction of M. C. Evans, manager of manufacturing research. Mr. Evans is a veteran of 28 years service with Harvester and former manager of all the company's tractor manufacturing plants in the nation. Operating head of the new department is J. W. Armour, assistant manager of manufacturing research.

The foundry section is supervised by Garnet P. Phillips, past chairman A.F.A. Chicago chapter, who has long been active in the A.F.A. Gray Iron Division. Mr. Phillips is known for his numerous contributions to A.F.A. literature, especially in matters pertinent to alloy cast iron and test bar results.

Garnet P. Phillips

The proposed foundry section of the manufacturing research department is not yet installed. Final plans are now being completed.

When installed, the research foundry will be complete including pattern, melting, core molding, sand preparation, and cleaning departments, and a foundry laboratory for making special tests.

The foundry section will be equipped to produce experimental castings in practically the entire size and weight range used by various Harvester operating divisions. It will be able to carry on research in each phase of casting production.

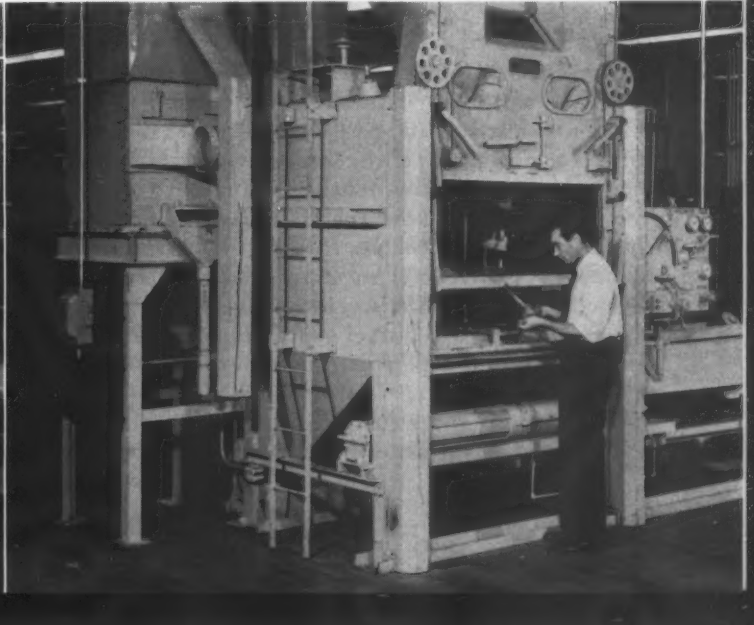
Research on raw materials used in cupola melting will be carried on as well as study of the effects of variation in moisture content of the air blast temperature up to 700° F. The section will also conduct research projects in core materials, core making, molding methods, sands and ingredients, and cleaning of castings.

In the production of experimental castings, the foundry section will be able to work out the gating and risering, the simplest and most efficient methods of core production and molding for a casting.

As now planned, the foundry section melting department will be equipped with a direct arc electric furnace, a No. 4 cupola lined to a 36-in. ID, and an air furnace. It will thus be able to produce molten metal with any one or any combination of three melting units either to produce a certain type of metal or

(Concluded on Page 84)

Left—General view of heat treating laboratory showing controlled atmosphere, salt bath, and hydrogen brazing furnaces and a sub-zero unit. Right—A shot peening machine used in the metallurgical laboratory for investigations in shot peening research projects.



BRONZE SAND CASTINGS

Porosity Control and Pressure Tightness

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London, England

A review of the work on causes and control of porosity in tin-bronze castings carried on by the B.N.F.M.R.A., recently presented before the Institute of British Foundrymen and published in Metal Industry, July 18, 1947.

DURING THE PAST TEN YEARS the British Non-Ferrous Metals Research Association has investigated the causes and methods of controlling porosity in tin-bronze castings. Three papers have been published, which present the experimental data in detail and discuss the mechanism involved in the formation of porosity and the effect of the porosity on the properties of castings. The object of the present paper is briefly to review the work done and to discuss its practical application, with particular reference to the production of sand castings required to be pressure tight in service, e.g., in such applications as valves, pumps and steam fittings for severe service.

Sand castings of this type are commonly made in phosphor bronze, gunmetals and leaded gunmetals, which collectively may be called the tin bronzes. The choice of these alloys for such components arises from one or more of the following notable characteristics:

(a) High resistance to corrosion in marine or other corrosive environments.
(b) Good bearing and wear resisting properties.
(c) Good casting characteristics.
(d) Good machining properties.

These properties are combined with moderate strength and ductility, but in most applications of these alloys considerations of strength are secondary to one or more of the properties cited in the foregoing.

Order of Characteristics

The order of importance of the previously mentioned characteristics obviously varies from application to application, but the order given is probably correct for the majority of cases. Thus the casting characteristics of the tin bronzes are probably third in the order of importance of their notable properties, and the object of this paper is to discuss these characteristics and to make practical recommendations, with a view toward exploiting them to the maximum advantage.

Copper-base casting alloys are frequently described as belonging to either the high- or low-shrinkage types; the high-tensile brasses and aluminum bronzes being typical of the first class and the various tin bronzes typical of the second. The classification arises from the fact that, in the first type of alloy, freezing shrinkage commonly leads to large pipes in feeder heads and runners, etc., whereas in the second type large shrinkage pipes occur far less frequently.

Strictly speaking, however, the classification is somewhat a misnomer, because, in fact, the actual freezing shrinkages of the two types are not very different. The distinctive difference between the alloys is that the first type freeze over a relatively short temperature range, while the second type freeze over very wide temperature ranges.

The practical consequence of this difference is that in the first type of alloy freezing shrinkage produces large but few cavities, and massive feeder heads are required to ensure that these cavities occur in the feeder heads and not in the casting proper. On the other hand, in the second type of alloy freezing shrinkage produces minute, intercrystalline cavities which tend to be widely dispersed through the casting and/or feeder heads.

Moreover, an appreciable amount of this dispersed porosity usually is present in the casting without serious detriment to the appearance of machined surfaces or to the serviceability of the casting. It is for this reason that it is normally possible to make serviceable castings in tin bronzes without resorting to elaborate and expensive feeding and chilling techniques, and this characteristic is quite attractive economically.

However, it is common experience that intricate castings of these alloys are liable to leak under pressure in certain parts. Magnitude of leaks varies from quite rapid, in the worst cases, to relatively slow seepage in mild cases, the latter being more common.

Gas Unsoundness

At the outset of the B.N.F.M.R.A. research program there was a wealth of literature available on bronze sand casting practice, in which this leakage trouble was almost invariably attributed to gas porosity. Numerous different melting practices were advocated, based upon practical experience in large-scale operations. There was considerable difference of opinion as to the identity of the gas or gases causing the porosity, some authors ascribing it to hydrogen and others to water vapor, sulphur dioxide or oxides of carbon. It was essential, therefore, to first establish the effect of various gases which might be present in bronze melts, and this was done in small-scale laboratory tests using closely controlled melting and casting conditions. The published results [1] of this work show that while slight gas unsoundness did arise from the oxides of surphur and carbon, the amount was quite small in comparison with that arising from hydrogen or water vapor. Melting and casting a straight copper-tin bronze in atmospheres containing hydrogen or water vapor caused marked

gas unsoundness, the gas porosity arising from the evolution of hydrogen and steam, respectively, during solidification.

However, if the bronze contained small quantities of phosphorus or other elements with high affinity for oxygen, the solubility of oxygen in the melt was reduced to a very low value so that practically none was available to recombine with hydrogen during solidification, and virtually all the gas porosity was due to hydrogen, whether the melt was prepared in a hydrogen or steam atmosphere. Since the alloys used in industry invariably contain phosphorus and/or zinc, it may be safely concluded that gas porosity in industrial bronze castings is almost entirely due to hydrogen dissolved in the liquid metal and rejected from solution during freezing.

Degassing Methods

Following this stage of the work, somewhat larger-scale laboratory tests were made to establish reliable degassing methods for typical alloys, namely, straight tin bronzes with small residual phosphorus contents (from deoxidation with phosphor copper), phosphor bronzes and gunmetals. The results of this work [2] show that the well-known practice of melting in oxidizing atmospheres, or of adding oxidizing fluxes, etc., to the melt, was extremely effective with the straight tin alloys substantially free from powerful deoxidants. For alloys containing appreciable quantities of zinc and/or phosphorus, however, such treatment was much less effective.

This result was to be expected from the fact that these elements markedly lower the solubility of oxygen in the molten alloy, so that hydrogen dissolved in the metal is less easily removed by oxidation to form steam. Since nearly all the industrial alloys for sand castings are of the latter type, alternative methods of degassing were studied, based on the well-established fact that the solubility of hydrogen in metals is proportional to the square root of its partial pressure in the atmosphere surrounding the melt.

Thus, if a melt containing hydrogen is held in a suitable inert atmosphere for a sufficient length of time, the hydrogen diffuses into the surrounding atmosphere until the gas content of the metal is negligibly small. This process can be accelerated by increasing the exposed surface area of the metal, and it was shown that if the metal bath is vigorously agitated in a continually replaced atmosphere (virtually free from hydrogen or steam, etc.) the hydrogen in the melt rapidly escapes into the atmosphere and is swept away.

Practical Methods Developed

The process is frequently referred to as a scavenging treatment. For laboratory purposes, melts were thoroughly and rapidly degassed by passing a stream of dry nitrogen through the melt for 5 min at a speed such that the metal was violently agitated. Other methods, for more convenient application in practice, were also examined, two of which present relatively little difficulty in practical application.

The most convenient of these methods is a treatment using manganese ore, in which the ore is charged on the bottom of the crucible where it slowly decomposes during melting of the charge to liberate oxygen and carbon monoxide which steadily bubble up through the molten metal. The oxygen evolution occurs fairly early during the melting process, since the manganese ore (MnO_2), disassociates to Mn_3O_4 at temperatures of the order of 700C. Nevertheless, gas continues to be evolved throughout the melting period and, although it occurs fairly slowly, causing a gentle agitation of the melt, it carries on for a long time and is found to be quite effective.

It is believed that the Mn_3O_4 reacts with graphite in the melting crucible to liberate carbon monoxide which scavenges the melt. The amount of manganese ore charged usually is of the order of one per cent of the melt weight, and the only important point to note is that the ore must remain at the bottom of the crucible throughout melting. If it floats to the surface, or if it is charged on the surface of the melt, it can exert only an oxidizing effect and the desired scavenging effect is lost. The second process developed involves the treatment of the melt with carbon dioxide obtained as a decomposition product from marble chips.

One convenient method, used to introduce this material, employs a salamander tube about 3 ft long, about 1½ in. internal diameter and ½ in. wall thickness, closed at one end. Marble chips equal to about ¼ to ½ per cent of the melt weight are inserted loosely in the open end of the tube and the aperture roughly blocked with a piece of crumpled copper foil. The tube is then inserted in the molten metal, open end downward, and the heated marble evolves carbon dioxide which bubbles vigorously through the melt.

Experiments showed that this process was rather more certain in action than the manganese ore treatment when applied to phosphor bronzes, because in the case of phosphor bronze melts the evolution of gases from the manganese ore is less marked, presumably because the phosphorus reacts rapidly with the manganese oxides to form phosphates and so tends to inhibit the gas-forming reactions.

Oxidation Treatment

Pell-Walpole [3] has described an oxidation treatment for degassing bronzes which uses a copper oxide, borax and silica sand mixture, whose copper oxide content can be varied to vary the degree of oxidation. The flux has the merit of inexpensiveness. Perhaps more important, attack on melting crucibles is slight and, where necessary, can be further minimized by increasing its silica content. Tests in laboratories of B.N.F.M.R.A. have shown, as was expected, that phosphor bronze-melts, containing dissolved gases, are not degassed by application of this flux, even for prolonged periods.

On the other hand, with the gas-fired and coke-fired furnaces used in the association's laboratory, it has long been the experience that bronze melts are much less readily gassed than might perhaps be expected. In most of the work on degassing methods, the bronze melts were deliberately gassed by treatment with hydrogen before applying oxidizing treatments, etc.

It was not surprising to find, therefore, that if the flux advocated by Pell-Walpole is charged at an early stage during melting in such furnaces, the melts so produced are substantially free from gas and it seems likely that, used in this way, the flux may have a blanketing effect, tending to minimize still further any gas absorption by the melt from the furnace atmosphere.

Bearing in mind the simplicity of the treatment and the potential saving by reduction in melting losses, this melting practice for the various tin bronzes deserves careful consideration, notwithstanding the disclaimer that oxidation of alloys containing phosphorus or zinc is not likely to remove hydrogen already present.

Shrinkage—and Gas Unsoundness

Following the development of satisfactory methods for degassing on a reasonably large scale, research was directed to examine the precise effects of shrinkage and of dissolved gases on the properties of bronze sand castings. Practical experience shows that, if a bronze casting leaks under pressure, the leakage invariably occurs in certain parts of the casting where changes in section, junctions of section, bosses or ribs cause solidification to be locally delayed. Accordingly a disk casting, exhibiting one of these typical features, i.e., a central boss, was selected for test purposes, and sand castings of this form were made in straight tin bronze, phosphor bronze and gunmetals.

At an early stage it was found that phosphor bronzes absorbed hydrogen when cast into sand molds so that degassed alloys yielded sand castings containing substantial amounts of hydrogen gas porosity. The identity of the gas was established by extracting samples from unsound castings and it was shown that the amount of gas absorbed by the casting increased with the phosphorus content of the alloy and with the pouring temperature used.

Drying the sand mold at ordinary stoving temperatures did not prevent gas absorption, although it was somewhat reduced; to avoid it altogether it was necessary to stove the mold at very high temperatures, e.g., 900C, such that the clay bond was substantially dehydrated. The gas absorption could also be inhibited by adding to the alloys small amounts of silicon of the order of 0.3 to 0.5 per cent, which protected the molten metal by a tenacious film, presumably of a complex silicate, and the castings obtained were free from gas unsoundness and were notable for their remarkably smooth cast surfaces.

In later work it was found that aluminum paint on the mold faces largely inhibited the gas absorption. Pell-Walpole [4] recommends aluminum paint for chill molds and reports that the coating does not cause marked "gassing" of phosphor bronze. This suggested the present application to sand molds where a resinous base paint largely inhibited gas absorption. The paint usually was applied admixed with paraffin, which was burnt off in gentle skin upon drying with a torch.

Gas Effects Studied

Thus it became necessary to examine, not only the effect of shrinkage and of gas initially dissolved in the bronze melt, but also to examine the effects of hydrogen entering the casting by reaction with moisture in sand molds, and these three effects were studied in straight tin bronzes, phosphor bronze, gunmetals and leaded gunmetals.

The general line followed was to make large numbers of disk castings in each alloy, some substantially free from gas porosity from either source, some containing gas porosity due to gas in the metal before casting, and some made from degassed alloys which were allowed to absorb gas in the sand mold The casting was gated in such a way that it was imperfectly fed and, when precautions were taken to avoid either source of gas absorption, it was found that the disk casting tended to leak under pressure in the vicinity of the boss, either before or after machining off the cast surfaces.

Detailed examination of such castings showed that the shrinkage porosity was concentrated in the immediate vicinity of the bosses and consisted of small intercrystalline cavities that interconnected, thus explaining the leakage under pressure.

When gas was present in small amounts in the metal before pouring it had a beneficial effect in that, although the total amount of porosity in the disk casting was substantially unchanged, its distribution was quite different in the presence of gas. The amount of porosity in the vicinity of the boss was markedly reduced, and that in adjacent thinner parts of the disk was appreciably increased.

Thus a much larger proportion of the castings were pressure tight, because the more widely distributed porosity was not sufficiently concentrated near the boss to form connected cavities. Also, the tensile strength of specimens from the vicinity of the boss was correspondingly improved.

Test Specimen Properties

Even better results were obtained when the gas was derived by reaction between the metal and moisture in sand molds. Thus, when the melt was freed from dissolved gas and its phosphorus content was adjusted to promote some gas absorption in the mold, the porosity was distributed even more uniformly through the castings and the percentage of pressure-tight castings was further improved, as also was the tensile strength of specimens cut from the vicinity of the boss.

Results typical of the foregoing findings were illustrated [5] by a series of curves showing the pressure tightness and strength of specimens cut from disk castings plotted against the gas content of the metal; the gas content of the metal being indicated by the densities of separately cast test bars from the same melts. These test bars were well fed, so that gas porosity, arising either from gas in the metal before pouring or from gas absorbed from the mold, caused a reduction in the density of the bar and a corresponding reduction in its tensile strength.

The experiments showed that the various alloys behave somewhat differently. For example, the straight tin bronzes or phosphor bronzes (of low phosphorus content or alternatively cast in inhibited molds to prevent gas absorption in the mold) were the most prone to localized shrinkage porosity; gunmetals were rather less so, and the leaded gunmetals were least prone. For the last-mentioned alloys, it was necessary to restrict the feeding of the test casting even more drastically in order to produce localized shrinkage under pressure.

When this was done the introduction of gas was beneficial, as for the other alloys. These differences between the alloys, however, are differences of degree and are in no sense absolute, and for all the alloys it is concluded that leakage in sand castings subjected to fluid pressure is usually due to localized shrinkage porosity. This difficulty can be minimized, or avoided altogether, by deliberately producing a suitable amount of gas unsoundness, preferably by promoting some gas absorption in the sand mold.

It will be appreciated that the work described must be regarded as revealing and demonstrating the general principles to be followed in bronze sand casting practice rather than precise details of the practices which will be applicable to the wide variety of castings made. The important practical recommendations can be expressed in general terms as follows:

(1) For all castings the molten alloy should be thoroughly degassed by one or another of the three methods described.

(2) For simple forms of casting where cross-sections are uniform and where substantially complete feeding is practicable and economical, the phosphorus content of the alloy and the pouring temperature used should be kept at the lowest level compatible with other considerations. For high phosphorus bronzes, e.g., gears and bearings, it will also be desirable to use inhibiting paint on the surfaces in order to minimize gas absorption in the mold.

(3) For more intricate castings of variable section where complete feeding is impracticable or uneconomical, the phosphorus content of the alloy and the pouring temperature should be raised to levels which will cause a moderate amount of gas absorption in the mold; in this way the porosity, inevitably present in the casting, will be distributed as uniformly as possible, with resultant improvement in what would otherwise be the most porous parts of the casting. Again, further improvements may be sought, if economic considerations permit, by the local application of inhibiting mold paint; in this case, the aluminum paint should be applied only to those parts of the mold cavity where solidification is liable to be delayed, i.e., to the site of bosses, junctions of sections, etc.

Test Bars

In order to put these practical recommendations into effect, it is necessary, or at least very desirable, to have some simple means of confirming that the melt is adequately degassed as recommended. The simplest procedure for this purpose is to cast a well-fed test bar in a mold coated with inhibiting paint and dried. Bearing in mind the recommendations of the recent draft "Code of Procedure" published by the B.S.I., it is recommended that the wedge-shaped type bar, described therein, be cast in this way as an occasional check on melting practice.

Similarly, it is desirable that where gas absorption in the mold is used to improve intricate castings, as previously described, occasional test bars should be cast in uninhibited green sand to ensure that variations in the sand are not causing variations in the amount of gas absorption. The amount of gas absorption can be judged by the reduction in density and/or strength of these test bars compared with the properties of bars cast in inhibited molds.

It must be emphasized that test bars cast under these, or for that matter any other conditions, reflect only the condition of the metal and its behavior when cast into that particular test bar form. They can be used, therefore, only as a general guide in the application of the recommended procedure for the production of pressure-tight castings, and must not be construed as providing any evidence of the properties of the castings.

Where large numbers of identical or similar types of castings are made, the following procedure is recommended to arrive at the most favorable combination of phosphorus content in the metal and pouring temperature for the job. Assuming that the metal is degassed by one or another of the processes already detailed, and that the effectiveness of the procedure adopted has been confirmed by the use of test bars, a number of castings should be made with the phosphorus content of the metal and the pouring temperature at the lowest practicable level consistent with specification requirements and with freedom from misruns in the casting.

No General Rules

It is not possible to lay down hard and fast rules applicable to all castings, but, to judge from laboratory test results, the appropriate pouring temperatures and phosphorus contents for gunmetals and leaded gunmetals are likely to lie in the range: Pouring temperature 1,080 to 1,180 C; phosphorus content, 0.01 to 0.10 per cent.

For gunmetals and leaded gunmetal castings of simple form, which can be easily fed and in which the maximum overall soundness is desired, it is likely that material with the phosphorus content at the lower limit and cast at a relatively low temperature will give the desired result. The application of inhibiting paint to the mold surfaces is unlikely to offer attractive benefits.

Also, for castings of intricate form, suitable adjustment of the phosphorus content and/or pouring temperature is likely to be adequate to give the required distribution of porosity in such castings, but for particularly difficult castings it may be advantageous to apply inhibiting paint to sites where leakage troubles persist.

For some phosphor bronzes, where the specification for the material, or considerations of its wearing or bearing characteristics, may define the lower limit for phosphorus content, the pouring temperature may be the only variable which can be controlled for the present purpose, and the permissible temperature is likely to be in the range: for 0.25 per cent phosphorus, 1,050 to 1,150 C; for 0.50 per cent phosphorus, 1,020 to 1,120 C.

If, with the lowest permissible pouring temperature and phosphorus content, an undue amount of porosity still persists in castings of simple form, inhibiting paint applied in inflammable solvent is recommended in cases where maximum soundness is desired. For more intricate castings, where some gas absorption in the mold is desirable and where the phosphorus content and pouring temperature have been adjusted accordingly, these adjustments alone will normally be sufficient, but for particularly stubborn cases the local application of inhibiting mold paint is worth bearing in mind.

The foregoing trial-and-error procedure would obviously be practicable only where large numbers of castings were involved, but it is reasonable to suppose that experience in the application of the process would make it possible to choose the correct conditions for new jobs with but little risk of serious error.

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5. *Journal*, Institute of Metals, vol. 70, p. 373 (1944).

UNTIMELY DEATH OF PETER BLACKWOOD, A.F.A. MEDALLIST

PETER BLACKWOOD, who started the foundry of Ford Motor Co. of Canada Ltd., Windsor, Ont., in 1936, died October 29. His death came unexpectedly as he seemed to be making a good recovery from an operation which had been performed earlier in the year.

Mr. Blackwood was awarded the John H. Whiting Gold Medal of the American Foundrymen's Association at the Golden Jubilee Convention, in Cleveland, 1946, "for his developmental work on centrifugal castings and his influence on the free interchange of research data."

His many acquaintances and associates throughout the foundry industry mourn the passing of this man. Typical of the feeling toward "Pete," as he was known to his

Peter Blackwood

friends, is this telegram written by H. H. Harris, president, General Alloys Co., Boston, and received at the National Office:

"Peter Blackwood, superintendent, Ford Motor Co. of Canada, winner of national foundry award and world renowned foundryman, died October 29 and buried November 1. Blackwood's humanity, kindness, rare Scotch humor and inspiring loyalty to friends and associates set him above and apart from any man I have known. His contributions to foundry practice were unexcelled. He ran one of the world's largest foundries with sixteen electric furnaces completely mechanized with an assistant, two foremen and no melters. More foundrymen crossed the river to visit the Ford Canadian foundry than any foundry on earth. Blackwood did our experimental casting development on the General Electric I-40 jet engine. With speed and precision we had not thought possible he continued to supply Allison Div., General Motors, throughout the war. We were working with him on phenomenal new developments in casting complex and corrosion-resistant alloys when he took sick."

This is only one example of the high esteem in which "Pete" was held by his fellow men.

Mr. Blackwood was born in Glasgow, Scotland, 1884, and received his formal education at the Royal Technical College of Glasgow in metallurgy, metallography, foundry practice, chemistry, mining and geology. Upon entering industry, he obtained broad experience in blast furnace, open hearth and by-product operations of plants in Western Scotland. Prior to coming to the United States in 1910, he visited plants in North Africa.

Furnace Practice Knowledge

Coming to North America, he extended his knowledge of metal processes to include electric furnace, converter and Brackelsberg furnace practice both in the United States and Canada. For 11 years he held the position of superintendent of foundries at the Buick and Pontiac divisions of General Motors Corp., Flint and Pontiac, Mich. While at Buick he delivered weekly lectures on foundry practice, heat treatment and general metallurgy at the General Motors Institute of Technology.

While at Ford he conducted a great deal of experimental and production work on the centrifugal casting process, and a paper coauthored by Mr. Blackwood and John Perkins on this subject before the 1944 convention of A.F.A. in Buffalo, N. Y., excited widespread comment and was instrumental in directing the attention of many foundrymen to the advantages of the process. It was largely for his stimulation of broader foundry work on centrifugal castings and for his influence in making visitors welcome to inspect the Ford plant in Canada, that the John H. Whiting medal was bestowed upon him.

For his outstanding work in the conservation of material and labor at the Ford plant, he was awarded the Silver Fleet by the Netherlands Government in exile.

A member of the A.F.A. Ontario chapter, the deceased first presented a paper before A.F.A. in 1914.

Eastern New York Elects Officers

OFFICERS FOR the remaining chapter year were elected at the November 18 meeting of the A.F.A. Eastern New York chapter as the members gathered at the Circle Inn, Albany.

The following men were asked to serve the chapter during 1947-48: *Chairman,* Charles E. Killmer, Sr., Swan-Finch Oil Corp., Albany; *Vice-Chairman,* Alexander C. Andrew, American Locomotive Co., Schenectady; *Secretary-Treasurer,* J. A. Wettergreen, General Electric Co., Schenectady; *Directors,* C. Richards, Adirondack Foundries & Steel Inc., Watervliet; K. F. Echard, Eddy Valve Corp., Waterford; H. G. Hinricks, Hillsdale Foundry Corp., Hillsdale; P. C. Wilson, James Hunter Machine Co., North Adams, Mass.; L. G. Nelson, Ludlow Valve Mfg. Co., Troy; B. F. Sweet, Noble & Wood Machine Co., Hoosick Falls; R. DeVarennes, Rensselaer Valve Co., Cohoes; Jasper Wheeler, Wheeler Bros. Brass Founders, Inc., Troy; and C. King, Sandy Hill Iron & Brass Works, Hudson Falls.

Following the business meeting, the eighty members and guests were treated to a movie in color.

American Crucible Open House

FOUNDRYMEN FROM near and far registered recently at the "open house" sponsored by the American Crucible Company as they opened their new plant in New Haven, Conn. The shop was in full operation and guests were shown through on a tour of the factory by guides who pointed out the stages in the manufacture of crucibles.

STEEL TURBINE CASTINGS PRODUCTION PROBLEMS

John A. Wettergreen
Foundries & Pattern Div.
General Electric Co.
Schenectady, N.Y.

PROBLEMS ENCOUNTERED IN THE PRODUCTION of castings for steam turbines are, in many respects, no different from those encountered in producing other types of steel castings. In the manufacture of turbine castings it is necessary to be on the lookout for shrinks, cracks, sand inclusions, center-line weaknesses, porosity and all other defects sometimes encountered in the manufacture of steel castings.

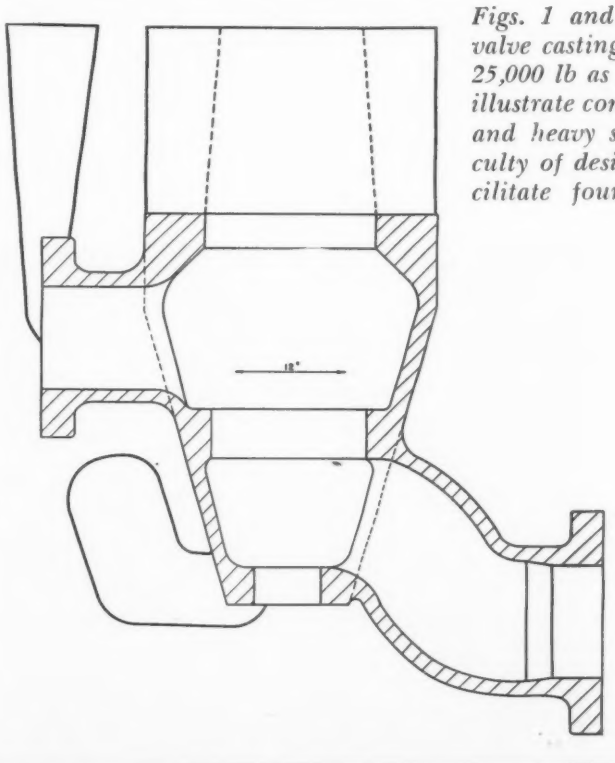
However, in addition to the ordinary difficulties, steel castings for turbines designed for high-temperature service must be of special compositions to meet the unusual conditions encountered in this type of operation. These compositions have properties which introduce complications in manufacture.

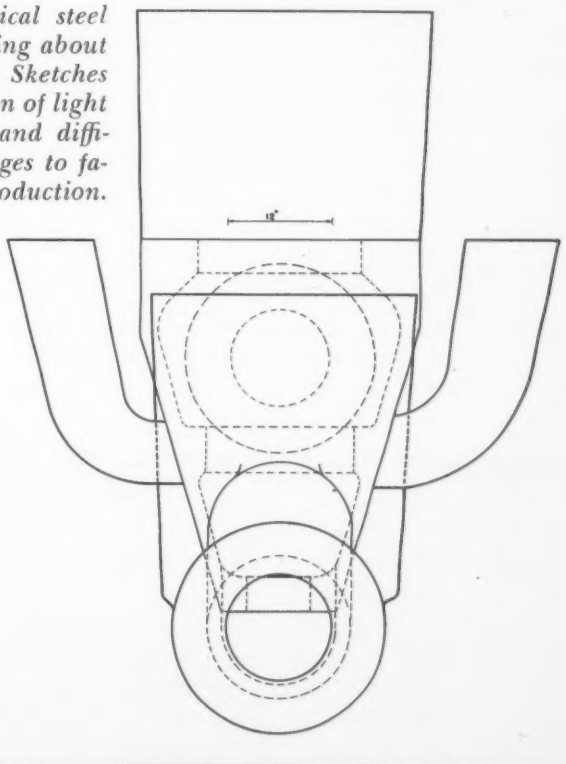
Also, the magnitude and significance of the defects related to these problems are greater because of the severe operating conditions to which turbine castings are subjected.

Designs of turbine castings are complicated. They embody combinations of light and heavy sections. The opportunity of incorporating properly tapered transitional sections is limited. The heavy sections often are in widely separated parts of the casting. This introduces special feeding problems, because some of the heavy sections are certain to be deep in the drag.

Turbine designs also incorporate small and complicated cored openings, often surrounded by heavy metal sections. Because of the limitations of component parts, built into or around the completed casting, the opportunities for radical design changes to facilitate the foundry production are sometimes limited (Figs. 1 and 2).

Quality requirements of turbine castings are of the highest order. The castings are subjected to all known means of non-destructive testing. Since turbine castings are subject to unpredictable defects, it is sometimes necessary to decide on the significance of these occurrences. In rare cases minor defects may be left without repair provided that careful inspection shows they do not impair the usefulness of the casting. Such





Figs. 1 and 2—Typical steel valve casting, weighing about 25,000 lb as poured. Sketches illustrate combination of light and heavy sections and difficulty of design changes to facilitate foundry production.

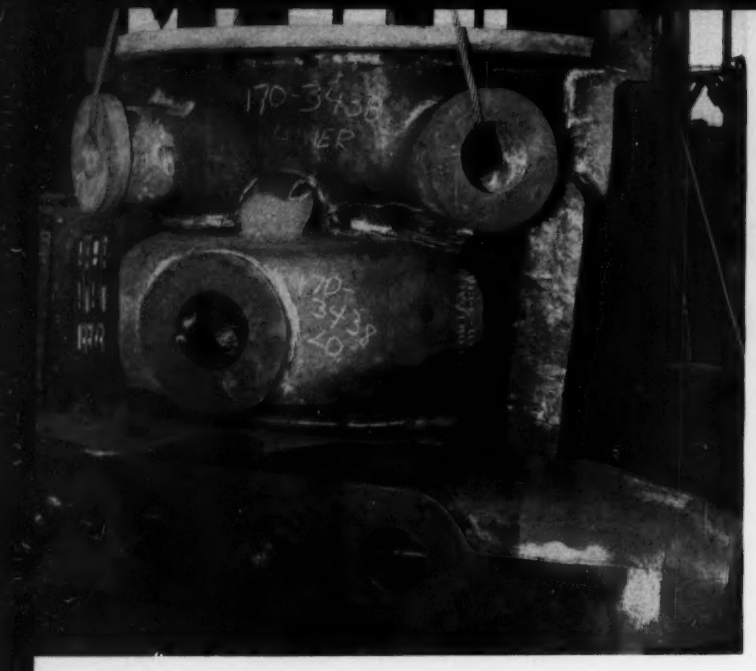


Fig. 3—Steam turbine shell casting of steel, weighing about 25,000 lb. This casting and the one shown in Fig. 4 were both cast from the same basic pattern. This casting has two extraction openings, with heavy flanges, and a heavy boss between the flanges. These are the chief differences from the casting in Fig. 4.

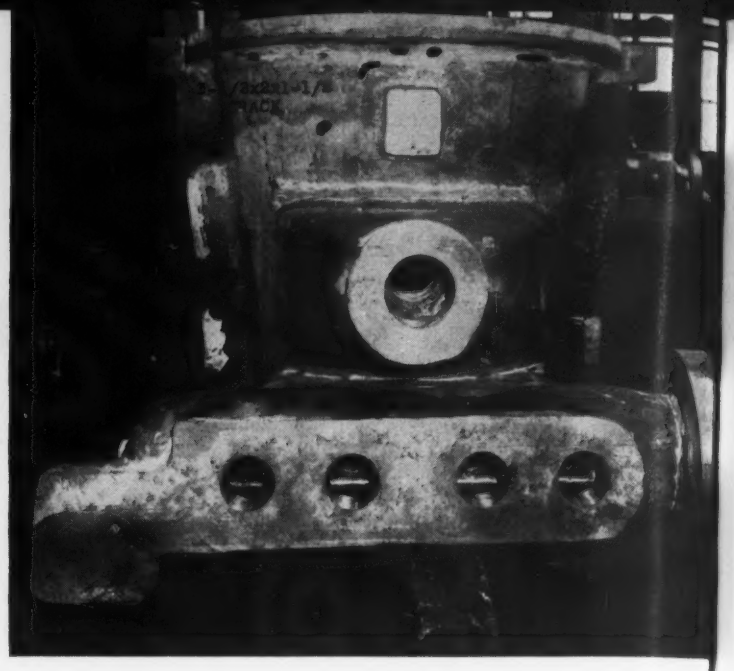


Fig. 4—Steam turbine shell casting of steel, weighing about 22,000 lb. This casting and that shown in Fig. 3 were both made from the same basic pattern, this one differing in that it does not embody the two extraction openings with flanges, but does have a heavy flange on the steam chest inlet pipe.

minor defects might be in the form of center-line weakness, which can be definitely fixed as to its position by stereoscopic x-ray. Such weakness can be tolerated only when located in low-stress sections.

Inconsequential surface porosity may also be tolerated when it is definitely confined to the outer surface of heavy sections. Aside from these exceptions, the castings must be sound as cast, or repaired under conditions carefully controlled to produce equivalent soundness.

This combination of design limitations and the extremely high quality required poses a serious problem for the foundryman not experienced in day-to-day production to such standards.

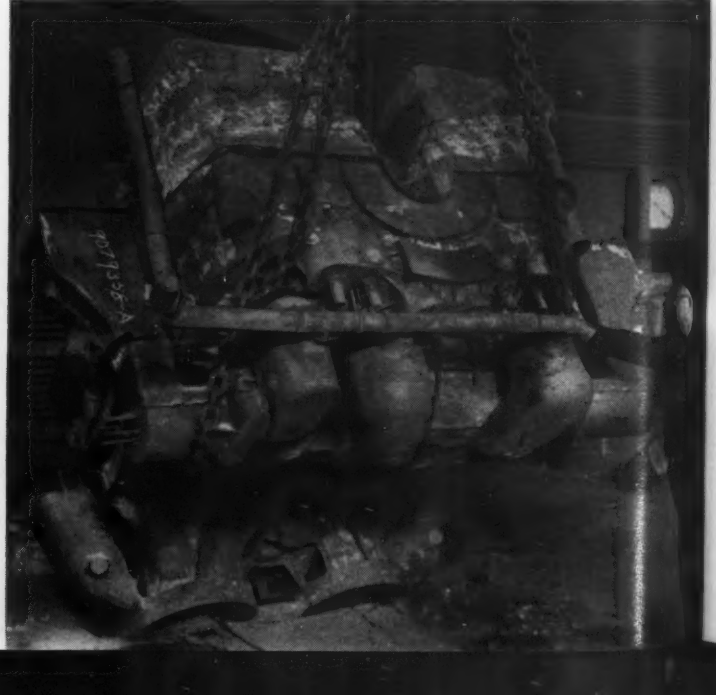
The two basic problems related to design are feeding and cleaning. The feeding problem is the fundamental one of providing proper temperature gradients in the solidifying casting, to ensure soundness. The Williams riser, in combination with chills, swells, pads and "heaters," is apparently the ultimate answer to this problem. It provides a fairly certain source of feed metal adjacent to the "hot spot."

Its successful application is often complicated by the engineer's desire to incorporate in one pattern several variations of a basic design. The result is that each variation presents an entirely new set of problems, or variations of problems, to the foundryman. He finds it difficult to relate the results of one attempt to the next. Completely consistent results have been obtained on this type of casting only when Williams risers were used on a number of successive castings without pattern alterations involving the introduction of variables in the production.

The complications of varying designs are illustrated by Figs. 3 and 4. Here are two designs cast from the

Fig. 5—A medium-sized casting, about 40,000 lb poured weight, made without benefit of Williams risers.

Fig. 6 (right)—Casting similar to that shown in Fig. 5, but weighing about 60,000 lb and made with Williams risers to feed isolated hot spots.



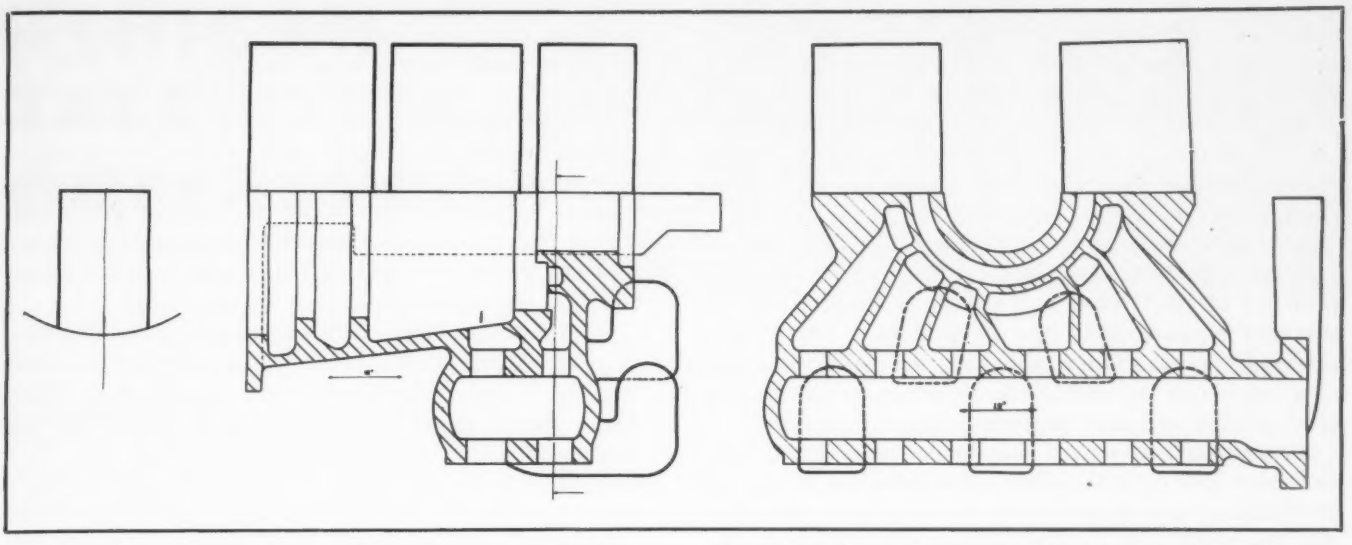


Fig. 7—Sections of steam turbine shell casting, illustratting the wide variance in sections encountered in steam turbine shell casting design. Use of Williams risers to feed isolated hot spots also illustrated. Finished weight of casting is about 20,000 lb.

same basic pattern. It is evident that the feeding problem is entirely different on the two castings.

Figure 5 illustrates a medium-size casting, approximately 40,000 lb poured weight, made without benefit of Williams risers.

Figure 6 shows a casting similar to that in Fig. 5, approximately 60,000 lb as poured. Here Williams risers have been used to feed isolated hot spots. Note the elaborate gating system used to ensure hot metal in the Williams risers. Risers such as these sometimes fail to function properly. It may be due to the fact that the sections adjacent to the hot spots are so slow in solidifying that they act as feeders, carrying metal to the hot spots in the drag. When this occurs, the Williams risers are often solid, indicating they did not supply feed metal as intended. The shrinkage cavity, which should be in the riser, is found in the casting at the junction with the riser. Experience has proved that the occurrence of this type of defect is minimized by a liberal use of external chills, which are used to isolate the Williams risers and the sections being fed from the remainder of the casting (Fig. 7).

Incidentally, it has been found that in applying Williams risers to these heavy-section, complicated castings, the normal rules governing riser and neck dimensions do not apply. Also, size of fillets used in the necks of the risers are a critical consideration and, of course, the necessity of gating to provide proper temperature gradients between the Williams risers and the casting is of importance the same as it is in any Williams riser application. On this type of work, obtaining proper temperature gradients often involves the use of two stopper ladles or two-ladle pouring.

Figure 8 illustrates the difficult cleaning problems associated with the production of turbine castings having complicated interior cored openings. The cleaning of these castings is costly because of two factors:

1. Low yield.
2. Behavior of sand mixtures under the temperature and pressure conditions imposed upon them.

The three tools most used in cleaning large steel castings are:

1. Pneumatic chipping hammer.
2. Shotblast.
3. Gas cutting equipment.

The first two of these tools are fundamentally inefficient. The manual effort required for their use is of a high order. There are few occupations in which the effort level is greater than is the case with chipping or shotblasting. The working conditions associated with the use of these tools are undesirable. The establishment of equitable and consistent incentives for the payment of operators is a nearly impossible task. The maintenance of this type of equipment is costly.

What are these cleaning tools used for? They are used to remove three kinds of foreign materials:

1. Sand.
2. Oxidized metal or scale.
3. Excess metal.

Both sand and scale can be dissolved chemically. Why attempt to "worry off" sand and scale by mechanical means when chemical means are available?

Fig. 8—Interior view of rough-machined steam turbine shell casting, of steel. Approximate weight is 30,000 lb. The picture illustrates the complicated cored openings which introduce serious cleaning problems.

We have learned that the gas gouging method is much more efficient for the removal of metal than the chipping hammer method. A deterrent to the broader use of gas gouging is the frequent presence of sand and scale. If we can remove sand and scale chemically and excess metal with the gas gouge, do we not have a combination which overcomes many of the shortcomings of our present methods?

With yields of under 50 per cent the removal of gates and risers presents a serious problem. The frequent presence of fused sand and penetrated metal around the riser necks complicates the problem. Often, considerable preparation is necessary before the gas cutting torch can be used. The problem of controlling sand mixing and sand ramming is ever present.

Experience has proved that by constant effort these variables can be controlled. The problem is one of establishing and maintaining controls over sand mixing, ramming, baking and washing practices to make certain that satisfactory results will be attained time after time. Every foundryman has seen special castings get the personal attention of key personnel, with highly satisfactory results. Subsequent castings, made without benefit of this attention, are seldom on a par with the "sample." How are we to attain and maintain the same high standard on all castings?

The laboratory man says, "By establishing technical controls over your operations." The foreman says, "Give us back the old-time mechanics with pride in their work." The superintendent says, "I guess I'll have to go out and run the shop." Perhaps the answer is to be found in a combination of these viewpoints—more technical controls, better mechanics, more attention to important details on the part of key supervisors. But the problem must be solved, if these critical castings are to be produced to a standard consistent with tomorrow's more severe requirements.

Those foundrymen who are producing turbine castings know that steam turbine operating temperatures and pressures are being increased year by year. They know that better castings are needed to build better turbines. When foundrymen fail to meet this challenge the welder is quick to grasp the opportunity to provide a substitute in the form of a weldment fabricated out of rolled plates. He is doing this every day, in many cases quite successfully. The point is, however, that he does it only after the foundryman fails. Fundamentally, the casting process is the best way to produce large turbine parts. We must find the answers to our problems, apply the correct principles, and establish controls which will insure consistently good and constantly improved results.

1948 APPRENTICE CONTEST OFFICIALLY OPENED BY A.F.A.

THE A.F.A. Apprentice Contest, held each year since 1924, was opened on November 10. Closing date is approximately April 1 when the judging will take place in Philadelphia. Competitions for 1948 include steel, gray iron and non-ferrous molding and patternmaking. Non-ferrous molding covers the light metals as well as the copper-base alloys.

These competitions are open to indentured apprentices in any shop, following the rules and regulations which are the same as those in force last year.

Prizes of $100, $50 and $25, respectively, for the first, second and third place winners in each of the four contests will be awarded. All winners receive a certificate of recognition signed by the Association President and Secretary-Treasurer. In addition, and as has been the practice for the past two years, the Association will pay the round-trip rail and Pullman fare for the first place winner in each division. A special convention luncheon for the apprentice winners will also be held by the Apprentice Contest Committee.

The committee furnishes blueprints for the patternmaking competition and patterns for the three molding competitions. For the first time in the history of the non-ferrous molding competition, plastic patterns will be used. Local competitions may be held either by individual foundries and patternshops or by groups or chapters.

The A.F.A. Apprentice Contest Committee is composed of the following: *Chairman,* R. W. Schroeder, foundry instructor, Chicago Navy Pier branch, University of Illinois; Prof. C. W. Morisette, asst. prof. industrial engineering, Pennsylvania State College, State College, Pa.; J. A. Havnen, asst. foundry superintendent, Wells Mfg. Co., Skokie, Ill.; G. E. Garvey, vice-president, City Pattern & Foundry Co., South Bend, Ind.; A. C. Gocher, foundry superintendent, Fletcher Works, Inc., Philadelphia; E. P. Meyer, general superintendent, Chain Belt Co., Milwaukee; P. M. Sanders, consultant, Eagle Rock, Calif.; Wayne Stettbacher, secretary, Employers Association of Detroit; G. Ewing Tait, assist. manager of manufacturing, Dominion Engineering Works, Ltd., Montreal; and G. A. Zabel, assistant superintendent, Universal Foundry Co., Oshkosh, Wis.

For further details concerning the rules and regulations of the contest write to the American Foundrymen's Association, 222 West Adams St., Chicago 6.

Kent Plans Foundry Courses

Kent State University, Kent, Ohio, is planning foundry courses with a three-fold objective, according to Professor Dewey F. Barich, head, industrial education department. The objectives are: (1) Training engineers for foundry supervisory positions; (2) Training foundry instructors for high schools, technical schools and colleges; and (3) Part time and night classes for employed foundrymen.

Plans for buildings, equipment and courses of study are being made with the assistance of the Canton District chapter and the Northeastern Ohio chapter of American Foundrymen's Association and the Foundry Educational Foundation.

MICHIGAN STATE CONFERENCE

Above—Chemistry building on the Michigan State College Campus, East Lansing, Mich. In the background is R. E. Olds Hall of Engineering where conference sessions were held.

FOUNDRY TRAINING, wage incentives, cupola operation, heading and feeding and sand problems portray the trend of thought of 170 midwest foundrymen who attended the annual Michigan State College Foundry Conference held October 31-November 1 at East Lasing, Mich. Three technical sessions were interspersed with a luncheon and banquet.

Suggestions for improving the selling job. to present and future foundry employees, that the foundry is a good place to work were presented by A. W. Gregg, Whiting Corp., Harvey, Ill. A poor selling job has been done by the foundry industry but in many cases training courses for all classes of foundry work has tended to break down the foundry's reputation. The average foundry today needs men for all positions — molders, coremakers, sand technicians, sales engineers and executives.

College graduates are being given a training course of 24 months duration, the first 18 months of general training and the last 6 is specialized training. The experience that the Whiting firm has had with college men was expressed.

Dreher Speaks

George Dreher, executive director, Foundry Educational Foundation, Cleveland, spoke on the workings of the foundation. Forty to fifty students interested in the foundry industry will graduate this year from the five schools taking part in the foundation.

The next job is to educate high school students and show them the numerous opportunities that are open to them following graduation from high school or college, if they care to continue their education.

Mr. Dreher also emphasized the educational job that must be done with industry. Many executives believe because a man has finished a course at college he can step in and fill the position of any man in his plant. This is not the case and consequently management must be educated on the type of man they will receive.

Chairman of the morning session W. G. Gude, managing editor, *The Foundry*, Cleveland, then introduced Dean H. B. Dirks, Engineering School, Michigan State College, who welcomed the foundrymen to the college. He gave a short discourse on the school's history and under what circumstances it is laboring with an overload of students and an understaffed faculty.

Work Measurement Defined

The determination of the best method of doing a given piece of work, and of the time required by an average worker to perform it was the definition of work measurement given by J. M. Apple, mechanical engineering department of the college, in the session on "Work Measurements and Wage Incentives."

Work measurement results are used for reducing costs, determining and controlling labor costs, a basis for wage payments, a basis for estimating time requirements of future jobs, a basis for production planning, means of comparing proposed methods and equipment, aid in calculating savings of proposed methods and aid in determining economy of new tools and equipment.

Procedure in work measurement can be divided into two categories, namely, methods study and time study. Under the former, such items as inspection requirements, material being used, material handling, tools and equipment, working conditions and operator's method have to be considered.

Concerning time study eight factors enter the operation; (1) standardize conditions, (2) record job data, (3) divide operation into elements, (4) record time data, (5) evaluate operator performance, (6) determine selected time, (7) apply rating factor and allowance and (8) determine standard time.

Wage incentive was defined as how a man is going to be paid for turning out a days work. C. H. Pesterfield, also of the college engineering department, said there were 17 basic wage incentive plans in industry today. Different plans starting with straight time to 60 percent and then piece work, straight time to 74 percent and then piece work and finally the Taylor plan calling for straight time to 100 percent then piece work were discussed by the speaker.

Dean Dirks acted as chairman of the luncheon at which Dean C. J. Fruend, college of engineering, University of Detroit, spoke on "The Veteran Student Looks at Employers and Jobs."

What the veteran student thinks of jobs and employers is very important for the simple reason that in a very few years the veterans will hold almost all jobs in industry.

What Are Veterans?

What manner of men are these veterans? Veterans are excellent men, on the average. They are mature, dignified and well behaved. They are resourceful and teamworkers, and display high morale.

The veterans respect any man for what he is, for his character and personality, but they are contemptuous of titles and rank.

During the round table discussion on steel, where Charles Locke, West Michigan Steel Foundry Co., Muskegon was chairman and E. C. Troy,

(Continued on Page 86)

ENGINEERING GRADUATES

College Recruiting for the Foundry Industry

David J. Mack
Assistant Professor of Metallurgy
University of Wisconsin
Madison, Wisc.

FOUNDRIES needing technically trained personnel must go directly to the universities and compete with other industries for the graduates of the engineering colleges. The foundry industry is increasingly interested in the employment of engineering college graduates. * Most recent evidence of this is the Foundry Educational Foundation program to be conducted in six of the nation's leading universities. While this program is designed primarily to train men for foundry management, it is expected that the program will also produce some men for other phases of foundry activity such as control, development, research and design.

Even when this program is in full operation it probably will not provide more than 75 engineering graduates a year. With rising production costs and the increasing technical demands being made upon foundry products, it is inconceivable that these 75 men could fill the yearly demands of the foundry industry for graduate engineers.

A few words about the competition for today's graduates is in order since the management of many foundries does not realize its extent or magnitude. It must be kept in mind that industry and science generally are still suffering seriously from the shortsighted selective service policies of the war years; these policies having been so far-reaching that American industry and science lost nearly a generation of technically trained graduates. This accumulated backlog of needed personnel could not, of course, be filled at once for many reasons, and it has led to very active competition for the men as they graduate.

Results of Competition

This competition has had several results. *First,* it has driven salaries up. While it may be argued that the increasing cost of living has been responsible, this has contributed only in a very minor way. Today's engineering graduates and those of the next few years are mostly veterans—older, mature, many of them married, and many with families. While these men may not know exactly the type of work they want, they are immune to pep talks, generally have a decided preference for a certain geographical locality, have pronounced ideas about minimum salaries and will be completely cold-blooded about picking their employer.

While the average starting salary of graduates was $220—$230 per month during 1946, this has risen until it is now about $250. A company offering $200 a month or less today will find few prospective employees, even among the least qualified men in a large graduating class. The only men apt to accept such a low figure are those men who, for some reason, feel they must locate in a particular city or take employment with a particular company irrespective of salary.

Second. Because of the large number of jobs available, the graduates are doing a great deal of shopping around before definitely committing themselves on accepting a position. Not only are the men looking at the salary, but they are considering the city or geographic location, available housing, transportation, the company and its history and policies, whether or not a training program is involved, company personnel policies, general working conditions and type of work.

Inform College Placement Officers

All of this means that the large companies which have been doing college recruiting for many years are, as a rule, in a more favorable bargaining position than the others because they and their policies are well-known to most engineering faculty members and college placement officers. Consequently, less well known companies or industries should make certain that the college placement offices are supplied with adequate brochures and descriptive material well in advance of a campus recruiting visit, thus giving the office ample time to acquaint interested students with the employment opportunities offered by the company.

Third. The foundry industry usually prefers graduates in metallurgical, mechanical or industrial engineering. The recent Boring Committee Report * has shown that the backlog demand for men with training in the metallurgical field probably will not be satisfied before 1955, although the backlog demand for engineers trained in other fields is apt to be largely satisfied much sooner—perhaps 1949 or 1950. This certainly suggests that the foundry industry will have to reconcile itself to this competition for engineering graduates for some years to come.

* "College Graduates in the Castings Industry," AMERICAN FOUNDRYMAN, Vol. 10, No. 5, Nov. 1946, pp. 72-75.

* "Foundry Training Course for College Graduates," AMERICAN FOUNDRYMAN, Vol. 11, No. 5, May 1947, pp. 97-99.

* "Cooperative Education from the Industrial Side," Edgar Hoover Bankard, AMERICAN FOUNDRYMAN, Vol. 12, No. 2, August 1947, pp. 58-61.

* Presented at the 55th Annual Meeting, American Society for Engineering Education, Minneapolis, June 17, 1947.

Personnel officers and graduation dates for the major engineering schools are included on a list available without cost from American Foundrymen's Association, 222 West Adams St., Chicago 6.

Assuming, now, that a foundry has decided to compete with other companies in hiring a member or members of a college graduating class, what is the procedure, and how does one go about contacting interested men? Most engineering schools either have a formally organized placement service or have one or more faculty members who handle placement as part of their regular duties. Other schools have a central personnel bureau which handles all placement work for the entire university, including the engineering college.

Some few schools do not have an organized placement service, such work being handled either through the Dean's office or by the individual departments of instruction such as mechanical engineering, industrial engineering, etc. Hence, when contacting a school for the first time, it is advisable to address the letter of inquiry either to the Dean of the Engineering College or to the Placement Office, College of Engineering. A letter addressed either way will be forwarded to the proper officer for handling.

Contacting the Students

Once the contact with the placement office has been established, they will suggest further procedure for contacting seniors or graduates of the school. Generally, two methods are suggested (1) a campus recruiting visit which includes personal interviews with the men or (2) impersonal solicitation through the placement office, resulting in the forwarding of names and personnel records of interested men to the inquiring foundry. Such impersonal solicitation is accomplished by bulletin board announcements, posting of current employment opportunity lists, reference to student's personnel data records, etc.

Regardless of which course is decided upon, the placement office will want certain information about the company (1. How large is it? 2. What are its products? 3. Where is it located?) and the positions for which it is soliciting men (1. What types of engineers are wanted? 2. What will be their duties? 3. Is a training program provided, and if so, what is it like? 4. Minimum starting salaries). This information is necessary for counseling with men who are interested in possible employment with the foundry.

The date for a campus recruiting visit should be mutually agreed upon at least two weeks in advance, thus giving the placement office adequate time to publicize the company's visit. An interview schedule is then arranged with men who have expressed an interest in possible employment, allowing 15, 20 or even 30 minutes for each interview, depending on the interviewer's desire in the matter.

If it becomes apparent several days prior to the proposed interviews that only one or two men are interested in talking with the company representative, he is usually so advised by telegram or long distance phone call, leaving the decision with him as to whether or not it is worthwhile to come to the campus as planned merely to interview one or two men. If the campus visit is called off the interested men can be contacted by letter.

One of the questions which always arises in connection with college recruiting is: What is the best time of year? War interrupted the education of most men in school today, and consequently they are irregular in their program of studies and one will find about the same number of men graduating at the end of each term. For schools operating on the semester system, graduation will usually occur in late January, mid-June and late August. For schools on the quarter system, there are four graduations a year, mid-December, early March, early June and late August.

No two companies will agree on the optimum time at which to contact seniors relative to employment upon graduation. On the basis of the writer's observations, it is felt that the best time for such contacts is between three and six weeks before the beginning of final examinations in any term. Perhaps this is too close to the end of the term, but with the present tendency of the men to be rather cautious about accepting a position, it is felt that this still provides ample time for both the company and the student.

The writer does not believe any useful purpose could be served by attempting to collect names of men who might be interested in employment in the foundry industry at the beginning of a school year or academic term. Such a list would be only a collection of names and undoubtedly would be badly out-of-date by the time it was completed. In order to hire the college graduate of 1948, one must have something specific and interesting to offer and it must be presented in the most dynamic fashion using all the approved techniques of good salesmanship.

Pre-Selection By Colleges

Many requests are made of college personnel bureaus and the bureaus are usually glad to cooperate with industry in any possible way. There is one request, however, that is so controversial in nature that it results in a great variety of responses. This request is that the personnel bureau or placement office pre-select men to be interviewed by a particular company. For example, some company will desire to interview only men from the upper 20 per cent of their class; another company wants only men who have all the traits of supersalesmen, and a third company may wish to see only those men with blue eyes and who wear size 9½ shoes or something equally absurd.

Some placement offices, particularly the older, well-established ones in smaller or specialized schools can, and sometimes do, accede to such demands for pre-selection, particularly if they happen to be intimately acquainted with the particular company over a period of many years. However, it is felt at the University of Wisconsin that such practice is rather dangerous for many reasons. It is unnecessary to consider these reasons here, but when such a request is made it is handled in either of two ways.

First, it is suggested that the chairmen of the individual departments of instruction be consulted for recommendations on individual students. When this has been done, the placement office will undertake to con-

tact the recommended students and make certain that they get on the interview schedule along with the interested students who sign up as a result of the bulletin board announcements of the company's visit.

Second, when the announcement of the impending recruiting visit is made, a quotation is included from the company correspondence describing the type of men they prefer to see. But also included is a statement from the placement office to the effect that, "This need not deter you from signing up if you have other qualifications and a genuine interest in the possibility of employment with this company." Both methods have been successfully employed in solving the problem of preselection of men by the University of Wisconsin placement office.

There is one other approach to the problem of contacting graduating seniors in our universities. This is the possibility of having a professional college recruiter do the preliminary contacting, interviewing and first screening of possible new technical employees. In most large cities there are consulting firms which specialize in personnel problems and technical recruiting.

These firms will undertake, on a contract basis, to visit the universities, interview interested men, administer aptitude examinations to select students outside of school hours and, in general, recommend a slate of candidates to a company for consideration. Fees are nominal and the results generally are highly satisfactory, since such firms already have the contacts with the universities and are thoroughly experienced in the problems of college recruiting. Such a firm could be profitably retained by a large foundry or by a group of foundries in one city or locality.

Regardless of the approach taken by a company, college placement offices are ready and willing to help in any possible manner.

Northwestern Pennsylvania Foundry Campaign Interests Australian

EVERYONE KNEW THE Northwestern Pennsylvania chapter had done a good job in advertising the foundry industry but did not realize how good until a request for more information on the campaign came from Australia. Recruiting problems, according to an Australian personnel manager are as great "down-under" as they are anywhere else.

The request for information and samples of the advertising literature (see AMERICAN FOUNDRYMAN, June, 1947, pages 28-29) was sent to Earl Strick, Erie Malleable Iron Co., former Northwestern Pennsylvania Chapter Chairman, who, with the chapter directors, organized the campaign.

Correspondence from Sweden and Scotland and visitors from France and Czechoslovakia to A.F.A. headquarters indicate that, while a foreign foundry is also a good place to work, it meets the same difficulty in securing workmen as in America.

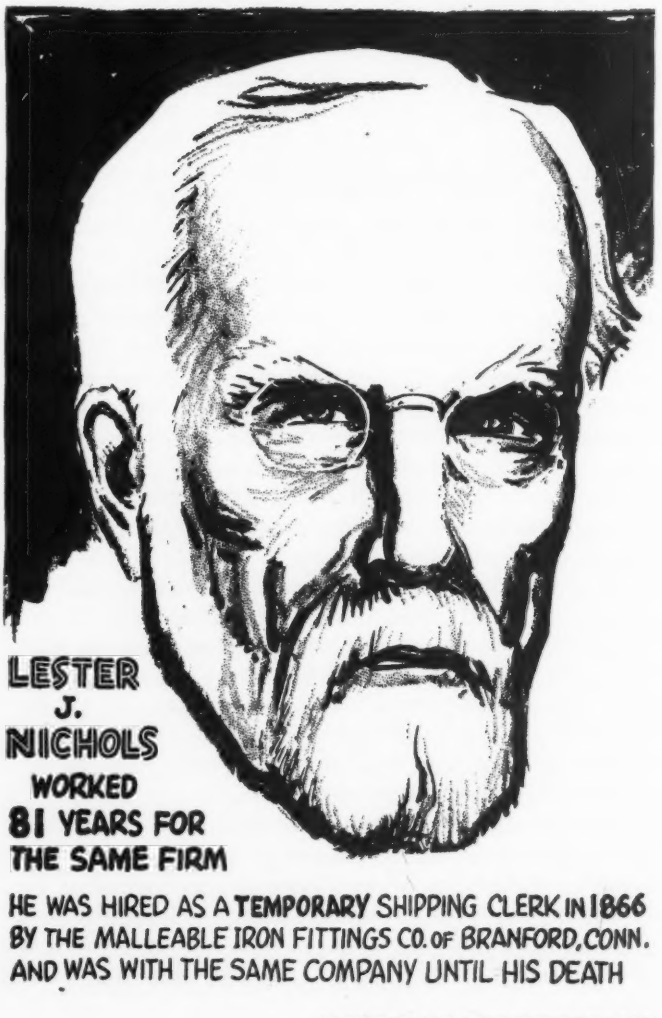
Melting problems also exist "down-under" where New Zealand gray iron foundrymen are considering conversion to electric melting to overcome the problems posed by poor coke.

Robert Ripley Honors Malleable Fittings "Old-Timer" In Column

THE illustration shown was recently run in Bob Ripley's noted "Believe It or Not" column, syndicated by King Features, which appears in many newspapers throughout the country. Wishing to follow-up on this interesting feature the Association wrote to T. F. Hammer, president, Malleable Iron Fittings Co., for some additional information. In his letter Mr. Hammer states "Mr. Nichols has received wide publicity for his rather unusual record . . . Mr. Nichols, as a matter of fact, was employed originally by my great-uncle in a temporary position as shipping clerk. He had expected to enter Yale College that fall, but my uncle, who expressed disbelief in college education, induced Mr. Nichols to become an apprentice bookkeepr. He often told of the interview with my uncle for assurance that the job was a steady one which, indeed, it proved to be."

At the time of his death, which was January 30, 1947, Mr. Nichols held the position of secretary of the Malleable Iron Fittings Co. He was in his 98th year.

As described in a recent bulletin published by the firm, "he was bright of eye, high in spirit, and fully alive to everything going on around him."


LESTER
J.
NICHOLS
WORKED
81 YEARS FOR
THE SAME FIRM
HE WAS HIRED AS A TEMPORARY SHIPPING CLERK IN 1866
BY THE MALLEABLE IRON FITTINGS CO. OF BRANFORD, CONN.
AND WAS WITH THE SAME COMPANY UNTIL HIS DEATH

Steel Castings – Engineering Uses

(*Continued from Page 44*)

vantage of the casting in both the static and dynamic tests made on the part as a unit. However, Smith and Morris were cognizant of this fact and concluded that the static strength characteristics of the casting and forging were equivalent.

The comparison parts were tested in a jig under repeated load conditions and gave similar life, the forging, however, being considered somewhat superior because of the slower propagation of the crack which eventually caused failure. Smith and Morris noted that there were several important factors which operated to the disadvantage of the casting and, therefore, concluded that the absolute fatigue strength (endurance limit/ultimate tensile strength) of cast steel would not be expected to differ greatly from that of forged material.

When cast steel parts are considered, those who investigate them frequently note that the tensile test specimens removed from actual castings have lower elongation and reduction of area values than do specimens removed from the direction of hot work in rolled or forged parts of comparable composition, heat treatment and tensile strength. This behavior is often taken as indicating inferiority of the cast material.

Summary

A few instances have been described in which steel castings have been or could be used to save time and cost in making engineering materials. It is seen that the steel casting process allows the designer great freedom in economically and effectively forming steel into a useful article. In many cases the adoption of cast steel design has resulted in a saving in weight and cost.

An attempt has been made to demonstrate that the most useful and reliable method of judging a casting is to subject the complete casting to tests which simulate actual service conditions. Such full-scale tests are to be preferred to those in which judgment is based on the results from small test bar coupons cut from the part in question.

It is felt that service and laboratory tests on properly made castings as units will, in the majority of instances, demonstrate that their performance is equivalent to comparison units of similar materials performed by other conventional methods. The casting process is an inherently sound method for shaping steel which under a great many design and production conditions offers the optimum solution to an engineering problem. It is hoped that the material presented can be of help to the engineer in solving such problems.

Acknowledgment

The writer is indebted to G. A. Lillieqvist for his encouragment and many helpful suggestions, and to many other associates in the American Steel Foundries for their assistance in assembling test data. Appreciation is also due the American Steel Foundries for permission to publish the paper.

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1. C. E. Sims, "Comparative Properties of Cast and Forged Steel," *The Foundry*, vol. 73, May, 1945, p. 90.

2. L. W. Smith and L. D. Morris, "Metallurgical and Structural Investigation of Steel Castings for Aircraft," *Transactions*, ASM, vol. 38 (not published as this is written).

Educational Lecture Course Is Offered to Metropolitan Men

THE A.F.A. Metropolitan chapter is again sponsoring this year a series of ten educational lectures pertaining to the "Fundamentals of Good Foundry Practice." These talks, extending from November 17 through April 26, are designed to show foundrymen the practical ways of doing a better job. All meetings will be held in the Sussex Avenue Vocational School, First St. & Sussex Ave., Newark, N.J., and start at 7:30 pm. A fee of $2.00 is being charged.

Lecture Schedule

Starting with the January 12 meeting the schedule is as follows:

Speaker—Martin Pepper, Whitehead Bros. Co., New York.

Subject—Engineering of Sand.

January 26 Speaker—B. N. Ames, New York Naval Shipyard.

Subject—Melting of Non-Ferrous Alloys.

February 9 Speaker—B. N. Ames, New York Naval Shipyard.

Subject—Gating and Risering of Non-Ferrous Pressure Castings.

February 23 Speaker—C. M. Apgar, Taylor Wharton Iron & Steel Co., Highbridge, N.J.

Subject—Practical Solution of a Difficult Casting Problem.

March 8 Speaker—G. F. Watson, American Brake Shoe Co., Mahwah, N.J.

Subject—Foundry Sand Control.

March 22 Speaker—C. J. Law, Worthington Pump & Machinery Corp., Harrison, N.J.

Subject—Complete Planning and Producing of a Casting.

April 12 Speaker—J. L. Carter, consultant, Newark, N.J.

Subject—Elementary Foundry Cost Methods.

April 26 Speaker—W. G. Reichert, W. G. Reichert Engineering Co., Newark, N.J.

Subject—Modernizing the Foundry.

William F. Rose, Smith Oil & Refining Co., Ramsey, N.J., is chairman of the lecture course series and G. F. Watson, American Brake Shoe Co., Mahwah, N.J., is in charge of registration.

Non-Ferrous Society Membership Elects Gluntz Their President

THE ANNUAL meeting of the Non-Ferrous Founders' Society was held in Chicago, October 16-18. William A. Gluntz, secretary-treasurer, Gluntz Brass & Aluminum Foundry Co., Cleveland, was elected president. Fred Haack, Jr., president, Capital Brass & Aluminum Foundry Co., Chicago, was named vice-president.

Retiring president, Chester K. Faunt, Christensen & Olsen Foundry Co., Chicago, and present A.F.A. Chicago chapter vice-president, in his annual report paid tribute to the late Thomas S. Hemenway. Mr. Hemenway died during his term as president of the society.

The members decided to enlarge their cost program and broaden their chapter activities over the country and also to encourage young men to enter the foundry industry.

FOUNDRY PERSONALITIES

B. D. Claffey, formerly manager, aluminum and gray iron divisions, General Malleable Corp., Waukesha, Wis., has been elected executive vice-president and general manager, Acme Aluminum Alloys, Inc., Dayton, Ohio. Mr. Claffey is a Past President, A.F.A. Wisconsin chapter; a Past National Director of A.F.A., and a member of the A.F.A. Educational Division, Executive Committee and Chairman, Youth Encouragement Committee, Educational Division. He is also a past director and vice-president, Gray Iron Founders' Society and a trustee of the Foundry Educational Foundation.

B. D. Claffey

D. E. Krause

Daniel E. Krause has been appointed executive director, Gray Iron Research Institute, Inc., with an office in Columbus, Ohio. Mr. Krause is a member of the A. F. A. Chill Test Committee, Gray Iron Division and Secretary, A. F. A. Central Ohio chapter. His duties will be to supervise the organization's plant service work and publications and have general charge of the administration research projects.

W. T. Coleman Carpenter has resigned as first vice-president, U. S. Pipe & Foundry Co. Mr. Carpenter, who has been a member of the company's board of directors since 1902, a member of the executive committee since 1912 and first vice-president since 1920, will continue in the two former posts.

Roger W. Griswold, Jr., formerly vice-president and director, The Griswold Mfg. Co., Erie, Pa., is now vice-president and director, White Aircraft Corp., Palmer, Mass. Mr. Griswold is a Past Chairman, Northwestern Pennsylvania chapter.

Fred Knisley has been appointed vice-president, foundry division, Tamms Silica Co., Chicago. Mr. Knisley has been with the organization for 25 years.

Charles D'W. Gibson and **John A. Hill,** vice-presidents, Air Reduction Co., Inc., New York were recently elected directors of the company. Mr. Gibson, vice-president in charge of sales, joined the company as a salesman in 1919. Since 1937 he has been vice-president in charge of sales. Mr. Hill, formerly secretary of the company, was made vice-president in 1945.

C. S. Lawson, vice-president, Sloss-Sheffield Steel & Iron Co., Birmingham, Ala., has been elected a director of the company. Mr. Lawson, who entered the company's service in 1915 as a chemist, fills the vacancy created by the resignation of Henry Parsons, New York.

H. A. Gehres and **Ralph L. Boyer,** The Cooper-Bessemer Corp., Mount Vernon, Ohio and Grove City, Pa., announce the elevation of these men in recognition of their outstanding record in the development of revolutionary improvements of its products.

Mr. Gehres has been named executive vice-president and Mr. Boyer's title is vice-president and chief engineer. Mr. Gehres began his career with the company in 1910, this was three years after his graduation from Ohio State University with a Bachelor of Science degree in mechanical engineering. He became chief engineer in 1920 and served in that capacity until 1935. He was named vice-president and director of engineering in 1935 in which capacity he served until his present appointment.

Mr. Boyer joined the company in 1926 as diesel engineer. He became assistant chief engineer in 1929, and chief engineer in 1938. He is also a graduate of Ohio State and holds B.S. and M.S. degrees.

Leicester L. Lewis, vice-president, The Tabor Mfg. Co., Philadelphia, has been named director of sales. Mr. Lewis joined Tabor in 1928.

E. A. Allan

L. L. Lewis

E. A. Allan is president, The Wadsworth Equipment Co., Akron, Ohio, which was formerly known as the Wadsworth Core Machine & Equipment Co. Other officers of the company are: **Ray Weaver,** secretary; **H. C. McLean,** treasurer; and **Thomas Short,** chief engineer.

J. L. Petresky has been appointed assistant to the president, in charge of production, National Bronze & Aluminum Foundry Co., Cleveland. Other appointments are: **J. B. Rearick** as comptroller and **A. J. Mosley** as chief engineer.

Mr. Petresky has been in the foundry business for the past 45 years, 25 of them with the present company. Prior to joining the company, he organized aluminum casting production for the Anderson Foundry of General Motors.

W. E. Odom and **J. E. Nyhan** have formed a partnership as consulting industrial engineers with offices at 20 No. Wacker Drive, Chicago 6.

J. E. Nyhan

W. E. Odom

C. H. Linder has been appointed assistant manager of manufacturing, General Electric Company's Apparatus Department. Mr. Linder, who has been assistant manager of the Schenectady Works since 1943, was graduated from the University of Texas, Austin, in 1924, with a Bachelor of Science degree in electrical engineering. In 1927 he received an M.S. in electrical engineering from the same school.

B. C. J. van der Hoeven has been appointed to the newly-created position of assistant general manager, chemical division, Koppers Co., Inc., Pittsburgh, Pa. Since early last year, he has been chief of the company's chemical engineering department, engineering and construction division. He joined the Koppers company in 1926.

A. F. Preuster, sales and service representative, eastern states territory, International Graphite & Electrode Corp., Niagara Falls, N.Y., and St. Marys, Pa., has retired after 17 years of service and will be replaced by **Charles A. Gierach.**

Mr. Gierach served for several years with the American Manganese Steel Div., American Brake Shoe Co. and for two years with the Navy during the war.

In three staff appointments, **C. S. Coggeshall** has been manager of sales; **W. E. Saupe,** manager, Schenectady turbine manufacturing division and **W. L. Young,** manager, Lynn turbine and gear manufacturing div., for the General Electric Co.

Mr. Coggeshall joined GE in 1911 and has been manager of the former turbine

sales division since 1938. Mr. Saupe has been with the firm since 1917 and has been advanced through a number of the company's departments and divisions. In 1946 he was superintendent of the turbine manufacturing division. Mr. Young came to GE in 1913 at Fort Wayne, Ind. He also has held several supervisory positions with the company. He was named manufacturing engineer of the turbine-gear division at the Lynn river works in 1942.

Dr. A. M. Blakely has taken a position in the production and development department, Vesuvius Crucible Co., Swissvale, Pa. Dr. Blakely, until recently, was vice-president in charge of production, at The Fuller Merriam Company, West Haven, Connecticut.

A. F. Vinson, assistant production manager, Apparatus department, General Electric Co., Schenectady, N.Y., has been named head of the company's Welding Equipment Division.

H. A. Bartling, who has been assistant manager, industrial sales department, Allis-Chalmers Mfg. Co., Milwaukee, is now manager of the new electronics section, which incorporates sales and engineering functions of the former rectifier section and electronic sales and engineering groups which were previously part of the control section.

L. W. Long is now manager of the substation section, formerly known as the mixed apparatus section, which he had served as sales engineer-in-charge.

Named manager of the firm's motor and generator section is **R. M. Casper,** formerly engineer-in-charge of sales of the section. **G. W. Clothier,** who has been engineer-in-charge of transformer sales, has been appointed manager, transformer section.

William Rodder has been elected vice-president in charge of engineering, Aetna-Standard Engineering Co. Mr. Rodder has been in Aetna-Standard's engineering department for 18 years, and has been chief engineer for the past 9 years.

R. H. Lundberg

William Rodder

Ralph H. Lundberg has been elected vice-president, The Peninsular Grinding Wheel Co., Detroit. Mr. Lundberg has spent 19 years of service with the engineering staff, Norton Co., Worcester, Mass.

W. G. Miller has been named assistant to the works manager, Buffalo division, Westinghouse Electric Corp. Mr. Miller has been manager of the headquarters manufacturing staff in Pittsburgh, Pa., since January, 1946.

E. F. Nason has been made aircraft sales and product manager, Elastic Stop Nut Corp. of America, Union, N. J. During the past year and a half Mr. Nason has been a member of the company's service engineering department.

E. F. Nason

H. O. Hill

Harold O. Hill has been elected president of the American Welding Society for 1947-48. Mr. Hill is assistant chief engineer, Fabricated Steel Construction, Bethlehem Steel Co., Bethlehem, Pa.

Harold H. Reed, formerly assistant manager, Air Reduction Sales Company's Metropolitan (New York) district has been appointed manager of this district. Mr. Reed succeeds **W. S. Schoenthaler,** who is retiring after 37 years of service with the company. Mr. Reed entered the employ of Air Reduction in 1923 as a member of the gas sales department.

Oren M. Donohue, formerly assistant sales manager, has been appointed assistant manager, succeeding Mr. Reed.

William B. Brower who joined the company in 1922 now succeeds Mr. Donohue as assistant sales manager.

J. F. McQuillan has been appointed superintendent, Whiting, Ind., plant, American Smelting & Refining Co. Former plant superintendent, **A. S. Wigle,** has been promoted to general superintendent of the Whiting plant. Immediately prior to his new appointment, Mr. McQuillan was superintendent, Perth Amboy, N.J., plant, where he had been located since January, 1945.

Professor Glenn T. Seaborg, University of California, Berkeley, has been awarded the William H. Nichols Medal of the New York Section, American Chemical Society for 1948. The award will be made March 5, at a joint meeting of the New York section and American section, Society of Chemical Industry, Hotel Pennsylvania, New York.

Roy W. Bennett, formerly sales manager, foundry division, Metro-Nite Co., Milwaukee, has joined the staff, Hydro-Blast Corp., Chicago. Mr. Bennett has been connected with American Steel Foundries and Harry W. Dietert Co.

Henry C. Winte, formerly plant metallurgist, Worthington Pump & Machinery Corp., Buffalo, N.Y., is now foundry superintendent, Motor Castings Co., Milwaukee.

Mr. Winte has been active in A.F.A. chapter and divisional activities. He is a past chairman of the A.F.A. Western New York chapter and was currently serving as a member of that chapter's board of directors. As a member of the A.F.A. Gray Iron Division he is on the Executive and Program and Papers Committee and is chairman, Chill Test Committee.

Arch J. Cooper has been made New York district office manager, Allis-Chalmers Mfg. Co., for the field organization of the general machinery division. The office will be headquarters for the fifth region, designated the Empire region, and includes New York, Buffalo, Rochester, Syracuse and Newark offices. Mr. Cooper, who has been associated with Allis-Chalmers since 1939, continues as New York district office manager in addition to regional manager.

Vernon L. Spinney, formerly New York petroleum sales representative, New York district office, has been named assistant district office manager.

William J. Devers, formerly public utilities sales representative, New York district office, has been named Newark district office manager, while **Ned W. Landis,** formerly branch manager of the Syracuse office becomes a district manager.

Earl Beyerlein is now metallurgist for the Bettendorf Works, J. I. Case Co., Bettendorf, Iowa.

Donald Gilchrist, formerly metallurgist and chemist, The Cooper-Bessemer Corp., Mt. Vernon, Ohio, is now associated with the Foundries Materials Co., Coldwater Mich., as sales engineer.

Harry A. Wright has been named engineer-in-charge of control sales on the control section, Allis-Chalmers Mfg. Co., Milwaukee.

P. L. Arnold

A. J. Zino, Jr.

Anthony J. Zino, Jr., has been made assistant sales manager, industrial sales division, Swan-Finch Oil Corp., New York.

Paul L. Arnold has been appointed resident manager, Chattanooga Works, U.S. Pipe & Foundry Co. His services with the company began in 1930 as a member of the research staff.

(Concluded on Page 92)

MANAGEMENT MEETS WITH THE A.F.A. PHILADELPHIA CHAPTER

THE SECOND annual management dinner meeting of the A.F.A. Philadelphia chapter was held November 5 at the Drake Hotel, Philadelphia.

Harry E. Ladwig, works manager, foundries and patternshop, Allis-Chalmers Mfg. Co., Milwaukee, and a past president, A.F.A. Wisconsin chapter, was the principal speaker. He chose to discuss "The Value of the Foundry to Industry" with the representatives of top management who were present.

The speaker mentioned that there are several important matters to which top management of foundries must give immediate attention in order to keep the foundry industry on a progressive rather than a retrogressive plane. Outlining only four of the more immediate and pressing problems, Mr. Ladwig suggested (1) improve working conditions, (2) sell the foundry industry to the public and future employees, (3) know your costs, and (4) stabilize employment.

Commenting on improving working conditions, the speaker said that very little has been done on this problem by the majority of foundry operators. Suggestions were advanced on how some companies were improving working conditions by installing better wash rooms, shower stalls and even laundries to wash the men's work clothes.

Thus with such improvements, as stated above, the industry can do a much better selling job to the public and future employees. Selling the industry must be done at various levels, too, the speaker urged—grade school, high school and college.

"Let's not go back to the old days of ruinous competition, which resulted from the lack of sound costing," advised Mr. Ladwig while talking on costs. "Only if we can keep our costs in line, can we successfully meet the competition within our own industry."

Three Members Added To National Office Staff

ABILITY OF the Association to maintain its service to a constantly growing membership has been further strengthened through the addition of three new members to the National Headquarters staff in Chicago.

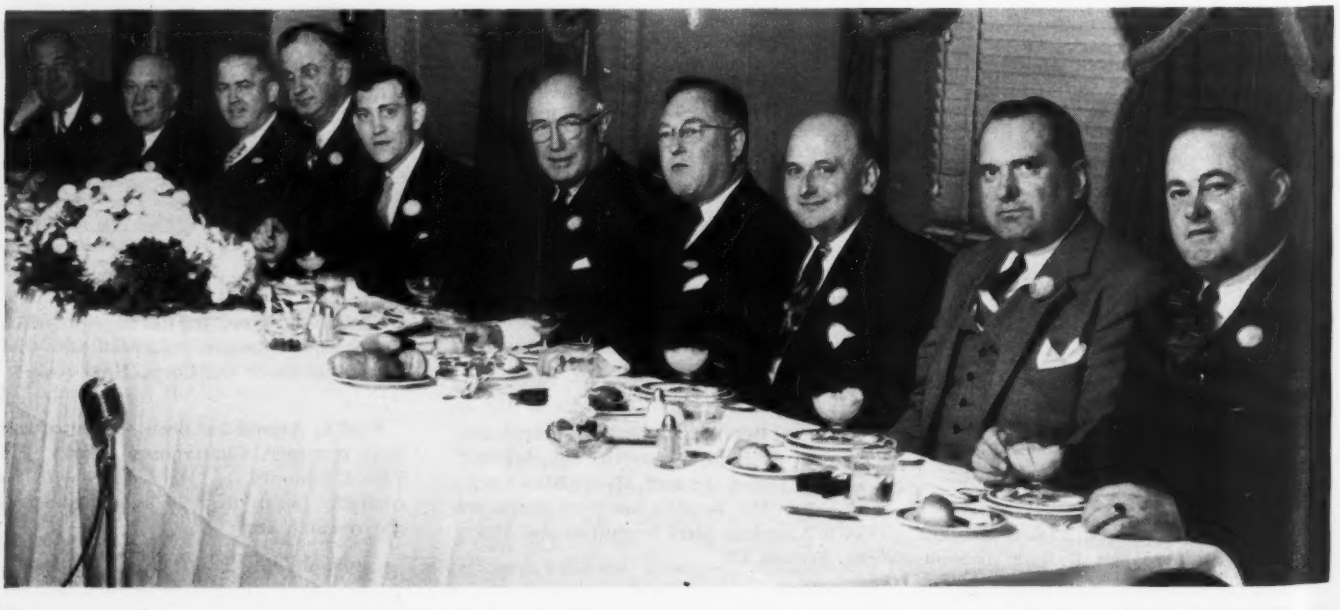
Alfred A. Hilbron, who joins the staff as Convention and Exhibits Manager, brings with him fifteen years of experience in exhibition and hotel work. Between 1932-35 he was in charge of one of the large commercial exhibits at the Century of Progress, Chicago, and later was engaged in designing and building commercial displays. Since 1937 he has been associated with the Hotel Sherman, Chicago, as exhibit manager, serving all exhibitions staged at the Sherman. He has also had considerable experience in the front office of the hotel, handling room reservations and assignments, and just prior to joining A.F.A. held the position of assistant manager, sales department, with entire charge of all convention activities.

On October 1, Mr. Hilbron took over his first assignment as Convention and Exhibits Manager, the staging of the American Foundrymen's Association 1948 Foundry Congress in Philadelphia.

On August 15, John D. Murray joined the National Office staff as Advertising Manager for AMERICAN FOUNDRYMAN, at which time Terese

(Continued on Page 89)

Speakers table at the second annual management dinner sponsored by the A.F.A. Philadelphia chapter. Starting left—Chapter Secretary-Treasurer W. B. Coleman, W. B. Coleman & Co.; G. H. Clamer, Ajax Metal Co.; A.F.A. Secretary W. W. Maloney, Chicago; guest speaker H. E. Ladwig; Chapter Chairman E. C. Troy, Dodge Steel Co.; Clarence Tolan, Jr., Dodge Steel Co.; A.F.A. Vice-President W. B. Wallis, Pittsburgh Lectromelt Furnace Corp., Pittsburgh, Pa.; Chapter Director B. A. Miller, Cramp Brass & Iron Foundries, Div., Baldwin Locomotive Works; A.F.A. Director J. M. Robb, Jr., Hickman Williams & Co.; and Chapter Vice-President C. L. Lane, Florence Pipe Foundry & Machine Co., Florence, N. J.



FOUNDRY FIRM FACTS

Baker-Raulang Co., Cleveland, is building an addition to its No. 2 factory, 8200 Baker Ave. Improved facilities for assembly, finish testing and shipping of industrial trucks, tractors and cranes, will be provided the **Baker Industrial Truck** division. Four 40 x 180-foot bays with craneways adjacent to railroad switches are under construction.

Laclede-Christy Clay Products Co., St. Louis, Mo., has purchased all capital stock of **Osceola Silica & Firebrick Co.,** Osceola Mills, Pa. A. B. Agnew has been named general manager of the Osceola firm.

Federated Metals Div., American Smelting & Refining Co., New York, has been licensed to manufacture "Everdur," an alloy of silicon bronze developed by **American Brass Co.** The division will produce the alloy in a composition designed for casting only, designated "Everdur 1000."

Anbar Foundry Co., 2011 S. Western Ave., Chicago, was recently acquired by **American Well Works Co.,** Aurora, Ill., and will be operated as a division of the firm. Brass and aluminum castings are manufactured at the Anbar plant.

Pacific Steel Foundry Co., Portland, Ore., has leased the government anchor chain manufacturing plant at 1979 N.W. Vaughn St., and will convert the facilities to the production of electric steel castings. The factory was formerly operated by **Pacific Chain & Mfg. Co.,** which has moved to a new location.

A foundry for production of iron and aluminum castings is being constructed near Flagtown, N. J., for a firm headed by **John W. Kalpin** of Somerville, N.J.

Production of $750,000 worth of two-way plows at the **Phillips Foundry,** Bakersfield, Calif., has begun. The plow has passed all engineering and field tests of the Ford Motor Co. and 10,000 of the plows will be manufactured at the foundry annually.

Allegheny Ludlum Steel Corp. has a nontechnical film available titled "Legend of Useppa." This movie tells the legend of a group of former pirate islands off the West Florida Coast and depicts a day of pleasure fishing for the famed silver king fighting tarpon. The picture is photographed in color. Requests should be made to the company's executive office, 2020 Oliver Building, Pittsburgh 22, Pa.

Eutectic Welding Alloys Corp. has opened a new major plant in Manhattan. The facility is located at 110 Duane St.

Peninsular Grinding Wheel Co., Detroit, has purchased all physical assets of the Detroit Star Grinding Wheel Co., Detroit. The new plant space totals 100,000 sq. ft. An extensive modernization and rehabilitation program has been started. When completed, this will be one of the modern vitrified grinding wheel plants.

A contract for the extension of electrical wiring at the **Pontiac Motor Car Div.,** General Motors Corp., Pontiac, Mich, has been let. The work extends power facilities to serve nine electric furnaces moved to a new location in the plant.

LeRoy H. Sturm, formerly with Wheeler consultancy, has established his own consulting service in Springfield, Mass.

All American Industries, Inc., recently acquired the entire outstanding capital stock of A. D. Cook, Inc., Lawrenceburg, Ind. This company, which has been in business for 66 years, is an outstanding manufacturer of a diversified line of pumps.

This is the third acquisition in allied fields by All American Industries, Inc., during the current year. It previously acquired Oklahoma Steel Castings Co., Tulsa and The Fitzsimmons Steel Co., Youngstown, Ohio.

A new $250,000 foundry will be ready for operation about November 1 in Exeter, Calif., and will manufacture castings for **W. A. Waterman Co., Inc.** The plant is 100 by 200 ft., with 20,000 sq. ft. of floor space.

William H. Exel and John N. Schultz are operators of the **Kalamazoo Brass Foundry,** Oshtemo, Mich., and plan to resume operations soon.

The Smith Falls Malleable Castings Ltd., Smith Falls, Ont., Canada, which was wiped out by a recent fire, is to be rebuilt. The project will be financed by a group of industrialists from Montreal. George B. Frost, son of the firm's founder, has been named vice-president and plant manager.

Organization of a new firm, the **Empire Pattern & Foundry Co.,** and expansion of manufacturing facilities of the Enardo Foundry & Mfg. Co., Tulsa, was announced by P. B. Drane, president of both firms.

The new plant will specialize in semi-steel and alloy work, iron and aluminum castings, wood and metal patterns and general foundry jobs.

The New Hampshire Forge & Foundry Co., Salmon Falls, is undergoing a complete reorganization since its disastrous fire of a year ago.

The United Aluminum Castings Co., Cleveland, has expanded its facilities by moving into its new modern equipped plant at 3471 West 140th St. The firm has increased its capacity from 40,000 lb. to an ultimate capacity of 300,000 lb. per month in the new building which occupies 7,500 sq. ft.

The Texas technical section, development and research division, **The International Nickel Co., Inc.,** formerly located in the Bankers Mortgage Building, has moved to Room 1107, Commerce Building, Houston 2.

The Ajax Engineering Corp., Trenton, N.J., announces that it has just signed a license agreement with the Scomet Engineering Co. for the purpose of exploiting the Scomet inventions and patents covering large size induction furnaces for melting metals.

The Harvill Corp., New York, has acquired a die casting plant on Roosevelt Road, Chicago, to be operated by the Harvill Mid-West Corp., a wholly owned subsidiary. The new plant has a complete engineering department and represents a $750,000 investment. The unit will be self-contained and equipped to handle the complete process from design and manufacture of die casting dies to the finished production of aluminum, zinc, magnesium and brass castings.

Paul M. Wiener Foundry, Muskegon, Mich., nears completion. The foundry has remained in operation while the new building was being built around and over the old structure.

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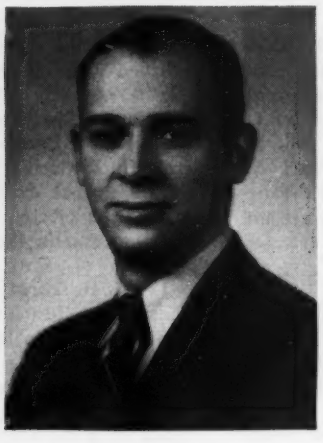
American Brake Shoe Co.
Mahwah, N.J.
Director
Metropolitan Chapter

L. C. Fill
Geo. D. Roper Corp.
Rockford, Ill.
Secretary
No. Illinois-So. Wisconsin Chapter



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Auto Specialties Mfg. Co.
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Michiana Chapter

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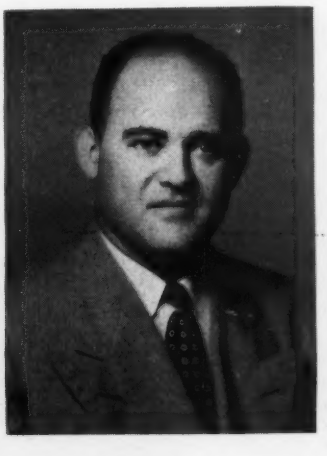
Buffalo
Director
Western New York Chapter



H. J. Druecker
Indiana Products Co.
Kokomo, Ind.
Director
Central Indiana Chapter

D. J. Merwin
Oriskany Malleable Iron Co.
Oriskany, N.Y.
Director
Central New York Chapter

★ NEW A. F. A. MEMBERS ★

October 15 - November 15 - "Hail to the victors valiant" rings out across the nation as the Rose Bowl draws near and the state of Michigan rallies behind its university football team. As strong in its support of A.F.A. as its gridiron heroes is the combined efforts of three Michigan chapters: Detroit, Central Michigan and Saginaw Valley. Tallying a total of 69 out of the 214 members published below, the three groups rated 1-2-3 respectively, in members attained. Thirty-two chapters contributed to this list.

BIRMINGHAM DISTRICT CHAPTER

Seldon Andrews, Supt., The Central Foundry Co., Holt, Ala.
Charles F. Bontwell, Frm., Stockham Pipe Fittings Co., Birmingham.
Grady C. Cooley, Frm., Stockham Pipe Fittings Co., Birmingham.
H. Clay Davis, Sales Repr., Alabama By-Products Corp., Birmingham.
J. V. Davis, Plant Eng., U. S. Pipe Foundry Co., Birmingham.
Raymond D. Freeman, Frm., Stockham Pipe Fittings Co., Birmingham.
J. P. Golden, Chief Engr., Goldens' Foundry & Machine Co., Columbus, Ga.
Herbert W. Hill, Frm., Stockham Pipe Fittings Co., Birmingham.
Carl P. Leibold, Sales, Beardsley & Piper Co., Birmingham.
Elbert E. Smith, Frm., Stockham Pipe Fittings Co., Birmingham.

BRITISH COLUMBIA CHAPTER

Weston C. Catherall, Patternmaking Instructor, Vancouver Technical School, Vancouver.

CANTON DISTRICT CHAPTER

*Union Wholesale Lumber Co., Youngstown, Ohio. (F. E. Hurley, Asst. Vice-Pres.)
T. W. Daniels, Carnegie Illinois Steel Co., Canton, Ohio.
Robert Gang, Asst. Frm. Pattern Shop, The Machined Steel Casting Co., Alliance, Ohio.
A. W. Hunt, Asst. Frm., The Machined Steel Casting Co., Alliance, Ohio.
Stephen J. Marmaroff, Fdry. Supt., Babcock & Wilcox Co., Barberton, Ohio.
J. G. McLean, Patt. Shop Frm., The Machined Steel Casting Co., Alliance, Ohio.
Elton H. Sellers, Chief Insp., The Pitcairn Co., Barberton, Ohio.
Edgar L. White, Fdry. Engr., James B. Clow & Sons Co., Coshocton, Ohio.
John R. Wiesen, Frm., The Pitcairn Co., Barberton, Ohio.

CENTRAL ILLINOIS CHAPTER

*Superior Foundry Co., E. Peoria. (Charles Bucklar, President-Treasurer)
George J. Avery, Frm., Peoria Foundry Div., M. H. Detrick Co., Peoria.

CENTRAL INDIANA CHAPTER

Robert D. Decker, Metal Engineering Co., Mitchell.
Guy W. Jones, Jr., Dir. of Costs, Swayne, Robinson & Co., Richmond.
Clinton Mazes, Coreroom Frm., Golden Foundry Co., Columbus.

CENTRAL MICHIGAN CHAPTER

George H. Bachman, Production Manager, Albion Malleable Iron Co., Albion.
Alfred A. Fierke, Core Frm., Gale Mfg. Co., Albion.
Chas. Fike, Supt., Hardie Mfg. Co., Hudson.
Frank H. Goll, Pattern Supv., Gale Mfg. Co., Albion.
Rollo Hastings, Molding Frm., Gale Mfg. Co., Albion.
Lewis Heisler, Metallurgist, Gale Mfg. Co., Albion.
Alfred L. Hollibaugh, Core & Maint. Supt., Gale Mfg. Co., Albion.
Emil Holtz, Chief Inspector, Gale Mfg. Co., Albion.
Rex. D. Humphrey, Foundry Frm., Gale Mfg. Co., Albion.
W. E. Hunt, Salesman, Industrial Metal Abrasives Co., Jackson.
Carlton Lamphier, Asst. Core Supt., Gale Mfg. Co., Albion.
Michael Masternak, Jr., Gen. Frm., Core Room, Albion Malleable Iron Co.
Westley Moore, Standards Engr., Albion Malleable Iron Co., Albion.
Emil Neitzka, Grinding Frm., Gale Mfg. Co., Albion.
I. M. Olsen, President, Industrial Metal Abrasives Co., Jackson.
M. B. Reed, Salesman, Industrial Metal Abrasives Co., Jackson.
Julius Rutz, Molding Frm., Gale Mfg. Co., Albion.
Edward H. Schlepp, Supt., Riverside Foundry & Galvanizing Co., Kalamazoo.
R. C. Schlosser, Fdry. Frm., Industrial Metal Abrasives Co., Jackson.
Chester Shepherd, Office Mgr., Gale Mfg. Co., Albion.
Arthur Thunold, Fdry. Supt., Gale Mfg. Co., Albion.

CENTRAL NEW YORK CHAPTER

William D. Brunig, Chief Engr., Bennett-Ireland Inc., Norwich.

CENTRAL OHIO CHAPTER

Howard G. Hart, Salesman, Harbison Walker Refractories Co., Portsmouth.

CHESAPEAKE CHAPTER

Warren H. Friske, Met., Naval Research Laboratory, Washington, D.C.
William Kelsor Hunt, Jr., Apprentice Instr., Newport News Ship Building & Dry Dock Co., Newport News, Va.
George H. Martin, Frm., Core Room, Chambersburg Engineering Co., Chambersburg, Pa.
David G. McFadden, Inspector-Foundry, Chambersburg Engineering Co., Chambersburg, Pa.
Robert H. Jones, Sand Supv., Lynchburg Foundry Co., Lynchburg, Va.
William John Richmond, Met., Naval Research Laboratory, Bellevue, D.C.

CHICAGO CHAPTER

E. Eugene Ballard, Chief Engr. Dev. & Installation, Lester B. Knight & Associates, Chicago.
John Bartus, Foreman Molding, Pettibone-Mulliken Corp., Chicago.
Theodore E. Burke, Sales Engr., Vanadium Corporation of America, Chicago.
John T. Davis, Frm. Core Dept., Pettibone-Mulliken Corp., Chicago.
George V. Ekback, Fdry. Frm., Hansell-Elcock Co., Chicago.
Rudolph Josephson, Foreman, Link Belt Co., Chicago.
L. Dale Hilton, Sales Repr., Chicago Retort & Fire Brick Co., Chicago.
Leslie W. Keeler, Industrial Engr., Wm. E. Pratt Mfg. Co., Joliet, Ill.
Lorenz Kich, Frm., Hansell-Elcock Co., Chicago.
Rene D. Michell, Production Mgr., Hansell-Elcock Co., Chicago.
John F. Morgan, Owner, Morgan Sales & Engineering Co., Chicago.
Herbert W. Mote, Electric Furnace Operator, American Steel Foundries, E. Chicago, Ind.
Paul A. Schroeder, Standard Dept., Pettibone-Mulliken Corp., Chicago.
Hal J. Smith, Salesman, Swan-Finch Oil Corp., Chicago.

CINCINNATI DISTRICT CHAPTER

Arthur P. Guidi, G.H.R. Foundry, Dayton Malleable Iron Co., Dayton, Ohio.
Thomas Harrison, Chief Inspector, G.H.R. Foundry, Div. Malleable Iron Co.
H. Y. Keeler, Sales Repr., U. S. Hoffman Machinery Corp., Huntington, W. Va.
C. W. Maier, Works Mgr., G.H.R. Div. Dayton Malleable Iron Co., Dayton.
Francis L. Webster, Repr., Fabreeka Products Co., Cincinnati.
James C. Wilson, Special Apprentice, Hamilton Foundry & Machine Co., Hamilton, Dhio.

DETROIT CHAPTER

Ralph C. Bearden, Sls. Engr., National Foundry Sand Co., Detroit.
Lawrence W. Bova, Insp. Supv., Wilson Foundry & Machine Co., Pontiac, Mich.
Elwood H. Bowdlear, Chemist, The Detroit Testing Laboratory, Detroit.
Edwin T. Bruce, Supv. Patt. Shop, Wilson Foundry & Machine Co., Pontiac.
Charles A. Bruning, Cons. Engr., Wilson Foundry & Machine Co., Pontiac.
Paul F. Buggs, Mill Room Supv., Wilson Foundry & Machine Co., Pontiac.
William G. Burder, Supt. Core Room, Wilson Foundry & Machine Co., Pontiac.
Earl Carnicom, Supv. Fdry., Wilson Foundry & Machine Co., Pontiac.
George C. Caverly, Frm. Fdry., Wilson Foundry & Machine Co., Pontiac.
Robert A. Coleb, Supv., Wilson Foundry & Machine Co., Pontiac.
Richard Collins, Frm. Fdry., Wilson Foundry & Machine Co., Pontiac.
Julius C. DeCamp, Supt., Fdry., Wilson Foundry & Machine Co., Pontiac.
Jack A. Farrell, Supv. Shakeout, Wilson Foundry & Machine Co., Pontiac.
Lester V. Grimshaw, Supv. Patt. Shop, Wilson Foundry & Machine Co., Pontiac.
Charles W. Horn, Frm., Detroit Arsenal, U. S. Army, Center Line, Mich.
Melvin L. King, Frm. Fdry., Wilson Foundry & Machine Co., Pontiac.
Mathew H. Middleton, Chief Insp., Wilson Foundry & Machine Co., Pontiac.
John V. Moriarty, Service Engr., Wilson Foundry & Machine Co., Pontiac.
Allan Nichamin, Dist. Sls. Mgr., Federated Metals Div., American Smelting & Refining Co., Detroit.
Charles Oxley, Supv. Special Assignment, Wilson Foundry & Machine Co., Pontiac.
Connie M. Perlsey, Patt. Shop Supt., Wilson Foundry & Machine Co., Pontiac.
Lawrence Pope, Frm., Wood Patt. Shop, Bryant Pattern & Mfg. Co. Ltd., East Windsor, Ont., Canada.
Chas. E. Rattray, Supt. of Standards, Wilson Foundry & Machine Co., Pontiac.
Ralph W. Schowater, Michigan Steel Casting Co., Detroit.
Joseph G. Seladi, Supv. Fdry., Wilson Foundry & Machine Co., Pontiac.
John P. Sellas, Sls. Mgr., Precision Casting Div., Michigan Steel Castings Co., Detroit.
Arthur H. Shepherd, Supv. Special Assignment, Wilson Foundry & Machine Co., Pontiac.
Dave Sherman, Supv. Mill Room, Wilson Foundry & Machine Co., Pontiac.
John Edward Sholes, Fdry. Insp., Wilson Foundry & Machine Co., Pontiac.
LaVern W. Stitt, Supt. Core Room, Wilson Foundry & Machine Co., Pontiac.
Richard J. Walsh, Frm. Fdry., Wilson Foundry & Machine Co., Pontiac.
Rector Wright, Michigan Steel Casting Co., Detroit.

E. CANADA AND NEWFOUNDLAND CHAPTER

*C. O. Clark & Bro., Ltd., Ville La Salle, Que. (Albert Clark, Mgr.)
J. W. Birke, Crane Ltd., Montreal.
C. C. Brisbois, Fdry. Cons., Montreal.

METROPOLITAN CHAPTER

Joseph D. Stout, Met., The International Nickel Inc., Bayonne, N.J.

MICHIANA CHAPTER

R. P. Bauer, Casting Buyer, Joy Mfg. Co., Michigan City, Ind.
Sam Denno, Sls., Buckeye Products Co., Cincinnati, Ohio.
Russell L. Rush, V.P., Plymouth Foundry, Inc., Plymouth, Ind.
Wm. Schlosser, Pres., Plymouth Foundry, Inc., Plymouth, Ind.
R. Schoenfeldt, Bridgman Co., Bridgman, Mich.

NORTHEASTERN OHIO CHAPTER

**Berea Foundry Inc., Cleveland. (Joseph S. Marcinek, Pres.)

* Company Membership

**Sustaining Membership

A. J. Filipic, Sls. Engr., Osborn Mfg. Co., Cleveland.
W. E. Flinn, V.P. & Gen. Mgr., The Superior Brass Mfg. Co., Mansfield, Ohio.
Wm. James Homan, Night Supt., The Ferro Machine & Foundry Co., Cleveland.
Franklin A. Kingseed, Shop Supt., Farrell Cheek Steel Co., Sandusky, Ohio.
Clifford H. Lambert, Plt. Supt., Eberhard Mfg. Co., Cleveland.
H. G. Leibold, Sls. Engr., The Cleveland Quarries Co., Cleveland
Alfred S. Morgan, The Babcock & Wilcox Co., Barberton, Ohio.
John H. Oligny, Fdry. Supt., Central Brass Mfg. Co., Cleveland.
Richard H. Olmsted, Sand Control Supvr., Lake City Malleable, Inc., Ashtabula, Ohio.
Nick Shirokey, Grinding Room Frm., The Fanner Mfg. Co., Cleveland.
Frank J. Stanley, Farrell Cheek Steel Co., Sandusky, Ohio.

NORTHERN CALIFORNIA CHAPTER

Wesley H. Hammond, Lab. Dir., San Francisco Naval Shipyard, San Francisco.

NO. ILLINOIS-SO. WISCONSIN CHAPTER

Peter Arnone, Core Room Frm., Geo. D. Roper Corp., Rockford, Ill.
Upton Bartlett, Treas., Alloy Castings Inc., Rockford, Ill.

NORTHWESTERN PENNSYLVANIA CHAPTER

Carl E. Anderson, Frm. Malleable Hard Iron Cleaning & Annealing, General Electric Co., Erie.
Edward J. Dworakowski, Frm., General Electric Co., Erie.
George W. Heyer, Frm. Coremaking, General Electric Co., Erie.
Lyman L. Lyle, Refractory Sls., E. S. Atkinson Co., Erie.
Carl J. Martin, Frm., Alloy Cleaning, General Electric Co., Erie.
William E. McLean, Frm., General Electric Co., Erie.
Lester W. Nystrom, Frm. Bench Molding, General Electric Co., Erie.
Thomas D. Pollard, E. S. Atkinson Co., Erie.
Joseph Puskus, Working Leader in Core Room, General Electric Co., Erie.
John M. Stewart, V.P., Hickman, Williams & Co., Pittsburgh.

ONTARIO CHAPTER

E. R. Bibby, Owner, Bibby Foundry, Galt.

QUAD CITY CHAPTER

A. G. Haight, Personnel Dir., Riverside Foundry, Bettendorf, Iowa.

ROCHESTER CHAPTER

Arthur J. Wuchmeyer, Mgr., Nunn Brass Works, Rochester.

SAGINAW VALLEY CHAPTER

Phillip L. Banfield, Inst., General Motors Institute, Flint, Mich.
Richard E. Bigelow, Core Dispatcher, Buick Motor Co., Flint, Mich.
Earl J. Bruebaker, Frm. Cupola Dept., Chevrolet Gray Iron Foundry., Saginaw, Mich.
Henri Dieterman, Engr., Dow Chemical, Bay City, Mich.
Alex Grier, Frm. Core Dept., Chevrolet Gray Iron Foundry, Saginaw, Mich.
Robert W. Hesse, Secy.-Treas., Valley Gray Iron Foundry, Saginaw, Mich.
Louis D. Kleekamp, Personnel Investigator, Chevrolet Gray Iron Foundry, Saginaw, Mich.
Joseph J. Kostick, Frm., Chevrolet Gray Iron Foundry, Saginaw, Mich.
Joseph A. Krawczak, Frm., Chevrolet Gray Iron Foundry, Saginaw, Mich.
Herbert W. Rikley, Supt., Cleaning Dept., Chevrolet Gray Iron Foundry, Saginaw, Mich.
Floyd M. Schultheiss, Asst. Frm., General Foundry & Mfg. Co., Flint, Mich.
Peter J. Simecki, Frm., Chevrolet Gray Iron Foundry, Saginaw, Mich.
John A. Smith, Fdry. Supt., Saginaw Foundries Co., Saginaw, Mich.
Olson D. Smith, Frm., Chevrolet Gray Iron Foundry, Saginaw, Mich.
Ray S. Strong, Asst. Traffic Mgr., Chevrolet Gray Iron Foundry, Saginaw, Mich.
Leland S. Toups, Pattern Maker-Appr., General Foundry & Mfg. Co., Flint, Mich.

ST. LOUIS DISTRICT CHAPTER

Ervin Kuenzel, Partner, Quality Pattern Co., St. Louis.

SOUTHERN CALIFORNIA CHAPTER

*Arcie Foundry Inc., Los Angeles. (Joe Carter, Gen. Mgr. & V. Pres.)
Emile F. Peschke, Fdry. Frm., Reliance Regulator Corp., Alhambra.
W. O. Wetmore, Head, Met. Section, U. S. Naval Ordnance Test Station, Pasadena.

TEXAS CHAPTER

Curtiss L. Bell, Fdry. Supv., Transmission Machinery Corp., Dallas.
William Harlan, Fdry. Frm., Trinity Valley Iron & Steel Co., Ft. Worth.
Lester G. Robinson, Fdry. Supt., Trinity Valley Iron & Steel Co., Ft. Worth.
Hugh B. Williams, Pres., Transmission Machinery Corp., Dallas.

TIMBERLINE CHAPTER

Charles W. Heffner, Owner, The Charles W. Heffner Agency, Denver, Colo.

TOLEDO CHAPTER

E. F. Chittenden, Dir. of Industrial Relations, Unitcast Corp., Toledo, Ohio.
J. C. Mayer, Owner, Mayer Pattern Works, Bryan, Ohio.

TRI STATE CHAPTER

Clarence W. Culbertson, Sls. Engr., M. W. Warren Coke Co., Kansas City, Kansas.

TWIN CITY CHAPTER

*Despatch Oven Co., Minneapolis, Minn. (C. P. Doherty, Vice-Pres. & Gen. Mgr.)
Edw. C. Anderson, Fdry. Tech., American Hoist & Derrick Co., St. Paul.
Carl H. Brady, Sls. Repr., Chicago Retort & Fire Brick Co., Minneapolis.
Julia Ann Gale, Chem. Met. Analyst, American Hoist & Derrick, St. Paul.
Karl E. Jaenecke, Pattnmkr., American Hoist & Derrick Co., St. Paul.
Bernie Mortinson, Frm., Prospect Foundry Co., Minneapolis.
William S. Mitchell, Chem., Frost Paint & Oil Corp., Minneapolis.
Melbourne S. Monitor, Pattern Storage, American Hoist & Derrick Co.
Fred H. Morrisse, Pattnmkr., American Hoist & Derrick Co., St. Paul.
R. C. Stolp, Sls., Milwaukee Foundry Equipment Co., Minneapolis.
G. L. Schuster, Vice-Pres., Chief Engr., Despatch Oven Co., Minneapolis.
Marvin Uhrhammer, American Hoist & Derrick Co., St. Paul.

* Company Membership

WASHINGTON CHAPTER

William J. Olsen, Shop Plannerman-Patt. Shop, Puget Sound Naval Shipyard, Bremerton.

WESTERN MICHIGAN CHAPTER

Claude A. Bosworth, Dir. Muskegon Public Schools, Muskegon.

WISCONSIN CHAPTER

Andrew A. Bottoni, Fdry. Instructor, Milwaukee Vocational School.
J. D. Claffey, Chief Insp., General Malleable Corp., Waukesha.
Edward Dvekar, Lab. Tech., Allis Chalmers Mfg. Co., West Allis.
Leonard Gratz, Accountant, G. & O. Pattern Works, Milwaukee.
August H. Mueller, Jr., Pres., Mueller Brothers Pattern Works, Inc., Waukesha.
O. H. Mueller, Secy. & Treas., Mueller Brothers Pattern Works, Inc., Waukesha.
George Rothenmaier, Standard Brass Works, Milwaukee.
William J. Schmidt, Ass't Frm., Allis Chalmers Mfg. Co., Milwaukee.
Ralph M. Stair, Frm., General Malleable Corp., Waukesha.
T. E. Ward, Vice-Pres., Badger Malleable & Mfg. Co., So. Milwaukee.
Lee Woehlke, Sls., J. S. McCormick Co., Wauwatosa.

NON-CHAPTER

C. Y. Clayton, Professor of Met. Engr., Missouri School of Mines, Rolla, Mo.
Joseph Dickman, Mfg. Engr., Westinghouse Electric Corp., Trafford Fdry., Trafford, Pa.
Walter E. Foreman, Grinding Engr., Norton Company, Worcester, Mass.
Ernest A. Geary, Westinghouse Electric Corp., Trafford, Pa.
W. J. Laird, Westinghouse Electric Corp., E. Pittsburgh, Pa.
Jay H. Suldan, Mfg. Engr., Westinghouse Electric Corp., Trafford Fdry.
C. Barnard Price, Jr., Abrasive Engr., Norton Co., West Hartford, Conn.
Addison E. Wilson, Grinding Engr., Norton Co., Worcester, Mass.

Argentina

Captain Policarpo T. Labate, Argentine Navy, Lt. Commander, Buenos Aires.
Ricardo Sanchez, Fdry. Frm., Naval Base, Puerto Belgrano, F.C.S.

Australia

Charles Horace Hadley, Fdry. Mgr., Stewarts & Lloyds Pty. Ltd., Mayfield, Newcastle N.S.W.

Belgium

Constant Montel, Tech., A.C.E.C. Charleroi.
Rappez Nicolas, Administrateur-Dir., Ste Ame Acieries de Haine-St. Pierre & Lesquin Haine-Saint Pierre.

Brasil

Carlos Dias Brosch, Met., Institute De Pesquisas Tecnologicas, Sao Paulo.

India

Gopal Chandra Sen, Lecturer in Mechanical Engr., College of Engr. & Technology, Bengal.
George Dunn, Kamarkatty Co. Ltd., Kamarhati P.O. 24-Pergs, West Bengal.

Palestine

Israel Yoshpe, Fdry. Supt., Vulcan Foundries Ltd., Haifa.

Sweden

R. Sokjer-Petersen, Engr. Vice Pres., Fyleverken A-B., Eriksdal.

Long - Range Industry Program Is Launched By Gray Iron Foundries

THE GRAY Iron Founders' Society, at its recent annual meeting in Milwaukee, agreed unanimously to launch a far-reaching program of industrial improvement based on a six-months comprehensive survey of the industry's problems. The first year's program, part of a ten year recommended plan, calls for sustained trade paper advertising schedule, organization of forty local groups of gray iron foundry executives covering all sections of the United States, a balanced technical development program and extensive public relations.

Also at the meeting Howard A. Stockwell, Barbour-Stockwell Co., Cambridge, Mass., was re-elected president. Other officers elected were: Ronald E. Kucher, Olympic Foundry Co., Seattle, Wash., vice-president; E. B. Smith, American Brake Shoe Co., New York, secretary; and Henry J. Trenkamp, Ohio Foundry Co., Cleveland, and past president A.F.A. Northeastern Ohio Chapter, treasurer.

Foundry Equipment Manufacturers Association Meets At Hot Springs

THE TWENTY-NINTH annual meeting of the Foundry Equipment Manufacturers Association was held at the Homestead Hotel, Hot Springs, Va., September 18-20. At the opening meeting, Friday morning, FEMA President Otto Pfaff, American Wheelabrator & Equipment Corp., Mishawaka, Ind., gave a complete appraisal of undulying fundamentals confronting the foundry industry, with particular reference to the equipment business.

A report on the progress of the National Castings Council was submitted by Thomas Kaveny, Jr., Herman Pneumatic Machine Co., Pittsburgh, Pa., FEMA representative on the Council. President Pfaff, the Association's representative on the Foundry Educational Foundation, told the FEMA membership that it was a member of the Foundation. He also described how the Foundation is gradually putting its educational program into effect at various universities.

William W. Maloney, A.F.A. Secretary-Treasurer was asked to comment on the 1948 A.F.A. Annual Convention and Exhibit which will be held in Philadelphia May 3-7 at the Philadelphia Convention Hall and Commercial Museum.

Relating the action taken by the A.F.A. Board of Directors to staging foundry exhibits not more frequently than every two years (see p. 36 September, AMERICAN FOUNDRYMAN), the FEMA was in agreement. A resolution passed by the FEMA acknowledging the A.F.A. action stated in part:

". . . that the exhibits in connection with A.F.A. National Conventions shall not be held more frequently than every two years; and that this association is wholeheartedly in accord therewith as being in the best interests of the foundry industry, and the A. F. A., and that A.F.A. be so advised by copy of this resolution."

The following officers were elected by the FEMA Board: Otto A. Pfaff, *President;* W. L. Dean, Mathews Conveyor Co., Ellwood City, Pa., *vice-president;* Arthur J. Tuscany, Foundry Equipment Manufacturers Association, Cleveland.

Elected as FEMA directors to serve a three year term were: W. L. Dean; G. H. Kann, Pittsburgh Crushed Steel Co., Pittsburgh, and John Hellstrom, American Air Filter Co., Inc., Louisville, Ky.

The 1948 FEMA meeting has been tentatively set for October at The Greenbrier Hotel, White Sulphur Springs, West Virginia.

FEMA President Otto A. Pfaff, American Wheelabrator & Equipment Corp., Mishawaka, Ind., checking over a few details with Executive Secretary A. J. Tuscany (seated). At the left is seated FEMA Vice-President W. L. Dean, Mathews Conveyor Co., Ellwood City, Pa. Action took place at recent FEMA annual meeting held in Hot Spings, Va.

THE MAGNESIUM ASSOCIATION
Mg
EDW. S. CHRISTIANSEN
FOUNDER
THE MAGNESIUM ASSOCIATION
THE VISION AND INCESSANT ENERGY OF EDW. S. CHRISTIANSEN TO CONSOLIDATE, PERPETUATE AND EXPAND THE PROGRESS MADE IN THE PRODUCTION AND FABRICATION OF MAGNESIUM DURING WORLD WAR II RESULTED IN THE ORGANIZATION OF THE MAGNESIUM ASSOCIATION DECEMBER 15, 1943
THE MAGNESIUM ASSOCIATION, BY RESOLUTION OF THE BOARD OF DIRECTORS PAYS ITS WARMEST RESPECTS AND DEEPEST GRATITUDE TO THE ONE WHO IS MOST RESPONSIBLE FOR THIS ACHIEVEMENT
JUNE 4, 1947

The Magnesium Association, at its recent meeting at the Seigniory Club, Quebec, Canada, recognized the effective ability and leadership of Edward S. Christiansen, to organize and head the Magnesium Association in its formative years. The honor attested Mr. Christiansen was expressed in the form of a plaque.

Golden Anniversary Meeting of the National Founders Association Held

THE THEME "First and Foremost" was carried out by the National Founders Association at its 50th Annual Meeting held November 6-7 at the Waldorf-Astoria Hotel, New York City. The Association had a well-rounded and energetic program that included a number of nationally known speakers.

Included in the array of speakers were National Directors B. L. Simpson, National Engineering Co., Chicago, and James H. Smith, Central Foundry Div., General Motors Corp., Saginaw, Mich. I. R. Wagner, Electric Steel Castings Co., Indianapolis, and NFA President, is a past A.F.A. National Director.

★ CHAPTER ACTIVITIES ★

news

Rochester

W. F. Morton
The Anstice Co., Inc.
Chapter Reporter

VARIOUS interpretations of the slogan, "The Foundry Is a Good Place to Work," were expounded by W. B. Hambley, foundry consultant, Milwaukee, during the course of his recent talk to the Rochester chapter on "Foundry Defects." Mr. Hambley began his talk by extolling "The Foundry—a Good Place to Work" and exhorting all A.F.A. members to zealous efforts to improve our industry, citing its importance in our national economy. Shifting the emphasis to "The Foundry—a Good Place to Work," he enthused over the opportunities and advancements possible through the application of foundry technology. The necessity for better housekeeping and the best possible working conditions that modern engineering can provide was stressed during the speakers talk.

The speaker listed the 31 defects recognized and described in the newly published A.F.A. book ANALYSIS OF CASTING DEFECTS.

Philadelphia

J. L. Furey
Swan-Finch Oil Corp.
Publicity Chairman

OVER 200 members and guests attended the first 1947-48 meeting of the Philadelphia chapter on October 10. The foundrymen gathered at the Engineers' Club to hear B. P. Mulcahy, consultant, Indianapolis, speak on the timely subject of "Cupola Operation."

E. C. Troy, Dodge Steel Co., Philadelphia, chapter chairman, presided at the meeting. Technical chairman was Clifton S. Merkert, Olney Foundry Div., Link-Belt Co., Philadelphia.

The manufacture of various types of cokes and their ultimate reactions in the economic market, metallurgical field and foundry operation were expertly pointed out,

A.F.A. Vice-President W. B. Wallis, Pittsburgh Lectromelt Furnace Corp., Pittsburgh, Pa., (seated center) with a number of Association Technique de Fonderie de Belgique dignitaries at a meeting in Liege, Belgium. Seated at Mr. Wallis' right is Mr. R. Deprez, Association President. Members of A.F.A. will recognize Mr. M. Remy, an Association Director, standing directly behind Mr. Wallis, as he was the Belgium representative at the Cleveland convention in 1946. This picture was taken during Mr. Wallis' recent visit to European industrial centers.

and shown that the coke shortage was not a local problem, but one of national scope. Various influences on the coke supply were discussed by the speaker. Also stressed was the proper manipulation, correct amount in each charge, and the proper size of coke, all of which have a direct bearing on the results obtained from the cupola.

Good Cupola Practice

In summarizing his talk, Mr. Mulcahy listed eight points that aid in bringing about good cupola operation; (1) proper handling of coke, (2) screen for correct coke size, (3) set the amount of coke to be used first, then calibrate the correct amount of air to use with the coke split, (4) have all intakes to the cupola in as straight a line as possible, (5) have the correct tuyere size, (6) have the correct amount of metal per charge for the particular cupola being used, (7) keep proper cupola dimensions in the daily patching, and (8) watch the details of cupola operation.

Timberline

James W. Creamer
Western Foundry Co.
Publicity Chairman

JOHN M. BURGESS, abrasive emery wheel div., Simonds Saw & Steel Co., Philadelphia, was the principal speaker at the September 23 dinner meeting of the Timberline chapter held at the Oxford Hotel, Denver.

The speaker discussed the development of the grinding wheel industry from Civil War days to the present time. He also stressed the need for safety and suggested that all plants abide by the safety code. After his speech, Mr. Burgess was the target for a number of questions which he answered very ably and informatively.

Metropolitan

W. H. Ferguson
Electro Metallurgical Sales Corp.
Chapter Reporter

PRINCIPAL SPEAKER at the October 6 meeting of the Metropolitan chapter was Clyde A. Sanders, American Colloid Co., Chicago.

"Casting Defects" was the subject covered and Mr. Sanders gave a very comprehensive discussion. The basic causes of each type of defect were discussed and remedial measures suggested. In the discussion period that followed, special causes of various defects were brought out. The 125 members and guests present took full advantage of the discussion to ask many questions and Chapter Chairman K. A. DeLonge, International Nickel Co., New York, the presiding officer, had to call a halt to the question and answer period.

An announcement of the lecture course was made and all were urged to attend the ten lectures which extend through the winter. "Fundamentals of Good Foundry Practice" is the theme of this year's course.

Central Indiana

Jack Giddens
International Harvester Co.
Chapter Secretary

AT THE Athenaeum, Indianapolis, on October 6, 125 members and guests heard U. S. Sullivan, Caterpillar Tractor Co., Peoria, Ill., present some new ideas on inspection. The title of his discourse was "Inspection of Castings from a Consumer's Viewpoint."

The speaker outlined the various inspection methods used by his company and used slides to illustrate a number of points.

Central New York

J. A. Feola
Crouse-Hinds Co.
Publicity Chairman

CHAPTER CHAIRMAN R. A. Minnear, Ingersoll-Rand Co., Painted Post., N. Y., presided at the November 14 dinner meeting of the Central New York chapter held at the Onondaga Hotel, Syracuse.

George K. Dreher, Foundry Educational Foundation, Cleveland, briefly explained the work that is being done by his organization in the development of trained men for the foundry industry.

Just to remind you fellows that there is a "good old summer time" now that the anti-freeze season has rolled around, we have printed these photographs taken at the Michiana chapter outing held in September at Sodus, Mich.

DECEMBER 15
CENTRAL OHIO
Chittenden Hotel, Columbus
FRANK STEINBACH
CHRISTMAS PARTY
The Foundry Trends in the Foundry Industry
The Foundry

DECEMBER 16
PHILADELPHIA
Engineers Club
CHRISTMAS PARTY

EASTERN NEW YORK
Circle Inn, Albany

DECEMBER 19
TRI-STATE
Mayo Hotel, Tulsa, Okla.
L. P. ROBINSON
The Werner G. Smith Co.
Variables in the Core Room

CENTRAL MICHIGAN
CHRISTMAS PARTY

DECEMBER 22
NORTHWESTERN PENNSYLVANIA
Moose Club, Erie, Pa.
CHRISTMAS PARTY

DECEMBER 23
TIMBERLINE
Oxford Hotel, Denver, Colo.
CHRISTMAS PARTY

BRITISH COLUMBIA
Auditorium Medical Dental Bldg.
Vancouver, B.C.
DEAN H. GOARD
Vancouver Vocational School

JANUARY 5
CENTRAL ILLINOIS
Jefferson Hotel, Peoria
H. W. DIETERT
H. W. Dietert Co.
Metal Pentration and Burnt on Sand

CENTRAL INDIANA
Athenaeum, Indianapolis
ED CLAAR
Eastern Clay Products, Inc.
A Progress Report on Plastic Bonded Molding Sand

METROPOLITAN
Essex House, Newark, N.J.
HARRY H. KESSLER
Sorbo-Mat Process Engineers
The Gating and Risering of Iron Castings

JANUARY 6
MICHIANA
LaSalle Hotel, So. Bend, Ind.
B. P. MULCAHY
Consultant
Cupola Operations

JANUARY 8
SAGINAW VALLEY
Fischer Hotel, Frankenmuth, Mich.
DR. RALPH LEE
General Motors Corp.
Engineering Humanics

TWIN CITY
Minneapolis-Moline Power Implement Co., Hopkins
C. R. SIMMONS
Durez Plastics & Chemicals, Inc.
Plastic Patternmaking

JANUARY 9
WISCONSIN
Schroeder Hotel, Milwaukee
SECTIONAL MEETING

PHILADELPHIA
Engineers Club
HERMAN GOOD
Textile Machine Works
Molding Core Making and Cleaning
ROUND TABLE

E. CANADA & NEWFOUNDLAND
Mount Royal Hotel
QUIZ NIGHT

CENTRAL NEW YORK
Onondaga Hotel, Syracuse
ROUND TABLE DISCUSSIONS

JANUARY 12
WESTERN MICHIGAN
Schuler Hotel, Grand Haven
CLYDE A. SANDERS
American Colloid Co.
Modern Progress in Foundry Sand Practice

CINCINNATI DISTRICT
Engineering Society Headquarters
R. L. LEE
General Motors Corp.
The Science of Humanics

JANUARY 13
ROCHESTER
Seneca Hotel
R. G. MCELWEE
Vanadium Corp. of America
Operations of Cupola with Present Day Material Shortages

NO. ILLINOIS—SO. WISCONSIN
Hotel Faust, Rockford, Ill.
E. T. KINDT
Kindt-Collins Co.
"The Pattern Industry—Past and Present Trends"

JANUARY 15
CANTON DISTRICT
American Legion, Massillon, Ohio
PROBLEM NIGHT

JANUARY 16
BIRMINGHAM DISTRICT
Tutwiler Hotel

JANUARY 19
QUAD CITY
Hotel Fort Armstrong, Rock Island
HARRY H. KESSLER
Sorbo-Mat Process Engineers
Gates and Risers

JANUARY 20
BRITISH COLUMBIA
Auditorium Medical Dental Bldg.
Vancouver, B.C.
PETER E. BAER
P. E. Baer Engineering Service
Casting Design

JANUARY 26
CENTRAL OHIO
Chittenden Hotel, Columbus
R. L. MCILVAINE
National Engineering Co.
Foundry Mechanization

The principal speaker of the evening was James Lansing, Malleable Founders' Society, Cleveland, who presented the subject "Malleable Iron Founding" to the eighty members and guests present.

Mr. Lansing's talk covered the malleable iron industry from the discovery of "white heart malleable" in Europe and the so-called "black heart malleable" in this country down to the methods now used in modern malleable foundry practice.

The speaker, using a series of slide pictures, showed recommended gating and risering practice for the economical production of sound malleable iron castings.

Speaker at the October 13 meeting of the Cincinnati District chapter was J. B. Caine, Sawbrook Steel Casting Co., Cincinnati.

Cincinnati District

C. H. Fredricks
Cincinnati Milling Machine Co.
Chapter Reporter

MEETING AT the Engineering Society Headquarters, Cincinnati, 122 local foundrymen heard J. B. Caine, Sawbrook Steel Casting Co., Cincinnati, discuss "Scabs, Buckles and Spalls." Presiding over the meeting was Edgar J. Kihn, Cincinnati Milling Machine Co., Cincinnati, chapter chairman.

The speaker explained a method of testing green sand for the metal castings industry. Tests were run on a variety of sand mixes, rammed to different hardness levels by varying the number of rams. The test specimens used were the standard A.F.A. sand mixes for the green compression test.

There were five basic tests run on each series of mixes to simulate various mold conditions. The steps were: (1) Expose test specimen to radiant heat for stated time intervals by holding the specimen about ½-in. above surface of molten metal. This test simulates the condition prevailing at the cope mold surface while the mold is being filled. (2) Expose to radiant heat as in (1) plus immersion in molten metal. This simulates the condition occurring when the metal comes in contact with the cope mold surface after it has been subjected to radiant heat. (3) Continuous immersion (stationary metal).

Test Technique

The specimen is immersed in molten metal to a depth of 1¾ in.; then withdrawn at stated time intervals. A new specimen is used for each time interval. This test simulates the behavior of sand in contact with metal in mold locations where there is little or no metal flow over the sand. (4) Alternate immersion (flowing metal). The specimen is alternately immersed and withdrawn from the molten metal at a frequency of one immersion per second. This simulates conditions prevailing at the mold surfaces as the first metal enters the mold, at the surface of the gates, or at any location where the metal flow across the sand is not continuous, as it is when metal is dropped some distance vertically, or near the gate on a flat horizontal surface. (5) Continuous immersion for a short time (2 seconds), followed by alternate immersion for simulating normal pouring conditions, being careful to use proper gating and pouring practice.

The results of the tests were cor-

Picture taken at the October meeting of the Canton District chapter. (Left to right) I. M. Emery, Massillon Steel Casting Co., Massillon, Past Chapter Chairman; J. L. Dickerson, The Pitcairn Co., Barberton, Chapter Secretary; D. F. Barich; Chapter Chairman C. F. Bunting, The Pitcairn Co.; E. T. Kindt; Fred Basler, A. P. Green Fire Brick Co., Canton; Otis D. Clay, Tuscora Foundry Sand Co., Canal Fulton, Chapter Treasurer; and Chapter Vice-Chairman E. H. Taylor, F. E. Myers & Bros. Co.

related with casting defects found when molds were rammed from the test mixtures. After most of the basic data were established, the casting defect could be predicted from the results of the tests.

Canton District

Nils E. Moore
Wadsworth Testing Laboratory
Chapter Reporter

THE SUBJECT discussed at the October meeting of the Canton District chapter was "The Pattern Industry—Past and Present Trends." Speaking on this topic was E. T. Kindt, Kindt-Collins Co., Cleveland. Mr. Kindt's talk was heard by over 100 members and guests. It was well illustrated, as he presented a movie showing a trip through a typical patternshop, and he described new machinery and methods used. He touched on the latest development of plaster casting, frozen mercury and the trend toward the use of the various plastic compounds as pattern materials.

Professor D. F. Barich, Kent State University, Kent, Ohio, was the coffee talker and he commented on the Foundry Educational Foundation's work at the University.

N. Illinois and S. Wisconsin

Carl L. Dahlquist
Greenlee Bros. & Co.
Chapter Technical Secretary

PALMER HANSON, manager, foundry equipment division of Arcade Mfg. Division, Rockwell Mfg. Co., Freeport, Ill., spoke to a group of 100 foundrymen at the October 14 meeting of the Northern Illinois and Southern Wisconsin chapter. The talk, "Molding Machines and Molding Methods," was given in the Hotel Freeport, Freeport, Ill.

He discussed the various types of molding machines; namely, jolt squeezer, jolt squeeze pin stripper, roll over machine, jolt squeeze roll over draw, large jolt squeeze pin stripper and the multiple molding machine. He said each machine has its specific application and limitations according to type.

The speaker pointed out that some molders lift and carry materials, including flasks, sand and bottom boards, totaling 134,000 lb. or 67 tons during a day's work. Consequently, the proper molding machine should be selected to eliminate much of this weight.

In commenting on the roll over machine, Mr. Hanson said this machine was very popular but trouble

Palmer Hanson, guest speaker at the October N. Illinois-S. Wisconsin chapter meeting.

is invited when wooden bottom boards are used as this usually results in warped castings.

He touched on the use of the large jolt squeeze pin stripper and the multiple molding machine which is known to produce 2,000 flat back shallow molds a day.

Modern Machines Installed

The speaker told of visiting a modern mechanized foundry with a sand handling system that continued to mold with antiquated molding machines. When modern machines were installed, they paid for themselves in a short time with jobs rigged that doubled or tripled production, thus paying large dividends on the installation.

Surveys should be made to see how many jobs fit each machine and in making such surveys the

The photograph below shows the head table guests at the first 1947-48 meeting of the Ontario chapter held in September. In the center, seated, is Chapter Chairman J. Dalby, Wilson Brass & Aluminum Industries Ltd., Toronto, and on his right, seated, is J. E. Rehder, metallurgical engineer, mineral dressing and metallurgical div., Dept. of Mines & Resources, Ottawa. Mr. Rehder was the guest speaker and spoke on the services conducted by the division, Bureau of Mines, in furthering the interests and advancements of the foundry industry.

molding machine operator should be called in to give advice. They have had much experience in rigging jobs and they are specialists in the molding business.

This being the first meeting to be held in Freeport since 1941, three local foundries were open for visiting; namely, Fairbanks Morse Co., Arcade Mfg. Co., and Woodmanse Co.

Texas

C. R. McGrail
Texaloy Foundry Co.
Chapter Reporter

THE Plaza Hotel, San Antonio, was the location for the October 17 meeting of the Texas chapter. W. H. Lynne, foundry engineer, Hughes Tool Co., Houston, addressed the meeting on the subject "Gases in Ferrous and Non-Ferrous Metals," a topic of general interest.

The speaker reviewed the basic theories concerning gases in metals as exist in chemical solution as well as in simple solution. Hydrogen, nitrogen and oxygen are the principal gases found in metals, and the degree of absorption is influenced largely by time and temperature. Absorption of gases can occur from the start of melting to final solidification, as from materials used in the charge or added to the melt, furnace linings, improperly dried ladles and to a great extent from the mold, particularly baked or vented cores and sand of low permeability.

Mr. Lynne emphasized that close attention to every detail in melting, pouring and molding is the only way to reduce gas absorption to a minimum. He pointed out the absorption of oxygen in relation to dissolved metallic oxides is governed by the oxide in the slag, and that oxidized metal exerts an internal pressure which prevents proper feeding.

Northern California

John Bermingham
E. F. Houghton & Co.
Publicity Chairman

FOR THOSE members who did not attend Northern California chapter's annual golf tournament and outing at the Orinda Country Club, San Francisco, October 17, it can only be said they missed one of the best tournaments ever held by Northern California chapter.

Chairman of the outing John Russo, General Service Foundry Co., Oakland, and his committee did an outstanding job in taking care of all the arrangements so that everyone attending could have a most enjoyable time.

Guests of honor included A.F.A. President Max Kuniansky, Lynchburg Foundry Co., Lynchburg, Va.; A.F.A. Director Robert Gregg, Reliance Regulator Corp., Alhambra; and A.F.A. Secretary-Treasurer William W. Maloney, Chicago.

The day was fine for both the golfers and horseshoe pitchers. A total of 45 golfers put in an appearance and a number of prizes were awarded to the lucky winners. The "barnyard golfers" earned their rewards, too.

Mexico City

N. S. Covacevich
Casa Covacevich
Chapter Secretary

THE MEETING held October 17 in the chapter's offices at Barcelona 11, Suite 203, was well attended. Ingeniero F. Gonzalez Vargas, chapter treasurer, gave a very interesting and informative talk on "The Use of the Sideblow Converter in Mexico" and illustrated his talk with colored slides.

Chesapeake

L. H. Denton
Baltimore Convention Bureau
Secretary-Treasurer

PROBLEMS RELATING to foundry coke were covered by J. A. Bowers, American Cast Iron Pipe Co., Birmingham, when he addressed the Chesapeake chapter, October 24, at the Engineers Club, Baltimore.

The speaker began his discourse by commenting on conclusions drawn by Dr. MacKenzie and O'Neill and Pearce in relation to research work on foundry coke. He also gave out some valuable data on experiments conducted by American Cast Iron Pipe Company on effect of coke sizing using an experimental cupola lined to 21-in. diameter.

He covered self fluxing coke, bottom or cupola drop coke, wet vs. dry coke, how to conserve coke and suggestions for cast iron foundry procedure. The latter consisted of seven points: (1) avoid dull iron at start of heat, also excessive scrap or pigged metal; (2) the proper height of bed is important and should be determined by each foundry to suit their own operating conditions; (3) a bed measuring device should be used, this device should be checked often as it has a tendency to elongate; (4) the maximum weight of iron charge should be known for each cupola, a saving of coke will result if cupola is operated on maximum iron charge; (5) the coke and iron should be evenly charged; (6) mechanical chargers should be checked constantly to insure good distribu-

Top—Northern California chapter golf tournament prize winners pose with Chairman John Russo and their trophies. Bottom—Head table at the evening banquet.

Left—At Southern California chapter's President Night, A.F.A. President Max Kuniansky (standing) talks to the membership. Seated next to the President is A.F.A. Director Robert Gregg. Right—An informal discussion before the meeting catches Chapter Chairman Hal Russill, Eld Metal Co. Ltd., President Kuniansky, guest speaker Lester B. Knight and A.F.A. Secretary-Treasurer William W. Maloney, together.

tion; and (7) the size of the pieces of scrap metal in the charge is important, i.e., it is easier to melt a piece 2 x 6 x 18 in. than a 6-in. cube. Bridging due to long pieces of scrap should be avoided.

Toledo

Rudy Van Hellen
Unitcast Corp.
Chapter Secretary-Treasurer

THE OCTOBER 22 meeting of the Toledo chapter was held at the Toledo Yacht Club.

A complete report on the Ohio State University's educational program and experimental foundry was presented to the members.

Southern California

R. H. Schaper
Westlectric Castings Inc.
Publicity Chairman

PRESIDENT'S NIGHT was the theme of the Southern California chapter's October 20 meeting. Gathering at the Rodger Young Auditorium, Los Angeles, the membership extended a warm greeting to A.F.A. President Max Kuniansky, Lynchburg Foundry Co., Lynchburg, Va.; A.F.A. Director Robert Gregg, Reliance Regulator Corp., Alhambra; and A.F.A. Secretary W. W. Maloney, Chicago.

Mr. Kuniansky pointed out some of the advantages and disadvantages of chemically treated sand, which his firm experimented with and is currently using in their production foundry. His remarks were well received and aroused considerable interest in this new foundry sand development.

Guest speaker was Lester B. Knight, Lester B. Knight & Associates, Chicago, who spoke on "Foundry Mechanization." He commented that foundries were losing out to other competitive fields like stampings, forgings, plastics and other materials, because foundries were pricing castings out of the field. This, he made clear, was due to lack of mechanization in many foundries, which lack results in high production costs.

In discussing how to increase production and cut costs it was suggested that four points be considered: (1) have a good wage incentive plan, (2) improve handling methods, that is, layout work in a straight line of flow, (3) improve supervision by training, and (4) standardize on a few flasks.

Northwestern Pennsylvania

Earl M. Strick
Erie Malleable Iron Co.
Chapter Reporter

ONE HUNDRED fifty members and guests attended the meeting of the Northwestern Pennsylvania chapter October 27, Moose Club, Erie. The night was designated top management and national officers night. Many local foundry executives were in attendance as well as A.F.A. Vice-President W. B. Wallis, Pittsburgh Lectromelt Furnace Corp., Pittsburgh, Pa., and S. C. Massari, A.F.A. Technical Director, Chicago.

Mr. Wallis gave an interesting talk on conditions in Europe as he saw them on his recent trip abroad.

"Hardening of Gray Iron" was the technical talk delivered by Mr. Massari. Much trouble arises from

the lack of familiarity with heat treatment of the metal, which should not be attempted without the knowledge of correct temperatures, the speaker said.

Fred Eisert, Urick Foundry Co., Erie, acted as discussion leader and Chapter Chairman John Clarke, General Electric Co., Erie, presided over the dinner meeting.

Central Ohio

H. W. Lownie, Jr.
Battelle Memorial Institute
Chapter Reporter

The featured speaker at the October 27 meeting of the Central Ohio chapter was Leonard W. Dean, Universal Castings Co., Chicago. Speaking on "Precision Castings," Mr. Dean described in detail the manufacturing processes for precision castings as used in the various organizations with which he has been associated. The materials and processes used to obtain close tolerances and fine finishes on commercial castings were covered in a broad fashion in order to familiarize the foundrymen present with this growing offshoot of their industry. Mr. Dean emphasized his feeling that there should be close cooperation between the specialists in the precision casting field with those in general foundry industry.

In the matter of costs, Mr. Dean stated that the labor involved in handling the many small molds, individual patterns, small metal melts, removal of castings from the rather hard investment material, and individual cleaning of the castings represents the major cost of precision castings. This cost can be expected to be drastically reduced as new techniques are developed.

Interest Shown in Method

The speaker's frank appraisal of the precision casting situation, and the intricate small sample castings which he demonstrated resulted in a spirited discussion.

Coffee speaker, Johnny Jones, *Columbus Dispatch,* preceded Mr. Dean's technical address. Mr. Jones, a columnist of wide popularity, enhanced his standing by reciting a number of alternately humorous and serious incidents that have stood out as highlights in his newspaper career.

Dr. D. C. Williams, industrial engineering department, Ohio State University, outlined to the chapter his plans for the enlargement and modernization of the foundry courses at Ohio State University. Courses in foundry practice on the graduate level are being added to the curriculum, and considerable new and modern equipment is being obtained. A student chapt of the A.F.A. is being formed at Ohio State University and will be the third such student chapter. The Central Ohio Chapter pledged its support to Dr. Williams to get the new student chapter under way, and appointed Mr. J. J. Witenhafer, Columbus Malleable Iron Co., Chapter Director, as a special representative to act for the chapter in facilitating the formation of the new chapter.

Quad City

C. R. Marthens
Marthens Co.
Chapter Secretary-Treasurer

A NEW TYPE of material for patterns was discussed at the October 20 meeting of the Quad City chapter when it met at the Fort Armstrong Hotel, Rock Island, Ill. The information on "Plastic Patterns" was passed on to the 100 members present by Ladd Salach, president, Plastic Corp. of Chicago. This plastic material for patterns was developed by Mr. Salach's organization for other fields but has gradually moved into the patternmaking industry. Although not in the pattern business, this company is fast becoming a factor in the manufacture of patterns with phenol formaldehyde type of plastic which is thermal setting. A colored movie was shown that illustrated how plastic patterns are being used in various foundries.

Central Michigan

C. C. Sigerfoos
Michigan State College
Chapter Vice-Chairman

MEMBERS OF the Central Michigan chapter were plant visitation guests of the Albion Malleable Iron Co., Albion, on October 28. Company officials served as hosts and chapter members were given an opportunity to observe the plant in full-scale operation.

Following the inspection trip, a dinner meeting was held at the Parker Inn Hotel, Albion. First speaker of the evening was Collins Carter, president and general manager, Albion Malleable Iron Company. Mr. Carter heartily wel-

The apprentice training program launched by the Southern California chapter has been ably supported by four men seated at the dinner table shown below. These men are Ralph Schaper, Vic Barton, M. Gwynn and H. Wenda. Mr. Schaper is Chairman, Chapter Educational Committee, and Mr. Barton, Chairman, Apprentice Training Program. Starting left the table is occupied by Mr. Schaper, L. G. Young, K. L. Clark, Vic Barton, M. Gwynn, H. Wenda and R. King.

comed the group to what he believed to be the first foundrymen's meeting in the city of Albion. He then outlined briefly the history of his company and their present modernization plans.

The technical speaker was Edward H. King, vice-president and general manager, The Hill & Griffith Co., Cincinnati. Mr. King spoke on the topic "Stabilizing Foundry Sands." He started his discussion by pointing out the necessity of a foundry developing a sand that will be reasonably stable under the heat shock and washing tendencies of pouring conditions. He cautioned foundries regarding quick changeovers to new ideas in sand mixtures and pointed out the many bad mistakes made by foundries in regard to synthetic and highly refractory mixtures.

This point was illustrated by giving examples of shops that have gone too far in producing refractory sand mixtures and as a result have sacrificed many other favorable sand properties. The speaker recommended that considerable attention be paid to the quick hot strength of molding sand so that the sand will be stable when first hit by the hot metal. From laboratory tests and practical experience in the shops, the speaker claimed that approximately one quart of cereal to 1000 lb. of sand or the addition of ½ to 2 per cent of carbonized cellulose to the sand would greatly benefit the quick hot strength of most sands.

A lively question and answer period followed Mr. King's address.

Canton District

Nils E. Moore
Wadsworth Testing Laboratory
Chapter Reporter

ROUND TABLE night featured the November meeting of the Canton District chapter and 115 members and guests divided into four separate groups where foundry problems of all types formed the basis of discussion.

Chapter Chairman Charles F. Bunting, The Pitcairn Co., Barberton, Ohio, introduced Prof. D. C. Williams and R. P. Schneider, Ohio State University, Columbus, to the membership. These men outlined plans for enlarging the present training program in foundry technology offered at the university. They also disclosed that industries in the vicinity of the school had given the laboratory a number of pieces of foundry equipment.

The coffee talk was made by F. H. Kaylor, American Steel Foundries, Alliance. He showed a number of colored slides of points of interest in our national parks.

The capable leaders of the four discussion groups were: steel, C. L. Fornwalt, Atlantic Foundry Co., Akron; gray iron and malleable, Carl Hall, American Cast Products, Inc., Orrville; time and motion study, T. C. McFall, American Steel Foundries; and core blowing, J. J. Popa, American Steel Foundries, both located in Alliance.

New England

Merton A. Hosmer
Hunt-Spiller Mfg. Co.
Association Reporter

THE REGULAR monthly meeting of the New England Foundrymen's Association was held on November 12 at the Engineer's Club, Boston. Professor Ben A. Lindberg, Harvard Business School, Cambridge, spoke on "Personnel Selection."

Selection Factors

Professor Lindberg pointed out many important factors which are involved in choosing men for supervisory positions as well as different types of jobs. He said a great deal of help could be obtained in selecting the individual for the job by questioning him. In other words, such questions brought out the applicant's interest, ability, aptitude and attitude. These four characteristics are most important in helping to get the right person for the job.

The attitude and interest of a person are the outcome of his education and environment, whereas, his ability and aptitude are inherited characteristics of the individual himself. The two latter attributes can be less readily altered than the two former.

He pointed out that the behavior of an individual varies as the individual and his environment, and that behavior also depends somewhat on time; i.e., the same person would behave differently on the day before the Pearl Harbor attack than he would on the day after.

Professor Lindberg's talk was well received and many interesting questions followed.

E. Canada & Newfoundland

H. E. Francis
Jenkins Bros. Ltd.
Chapter Reporter

"SINCE PRODUCTIVE capacity in gray iron, steel and bronze was not excessively expanded during the war, increased post-war demand could easily keep existing capacity busy for a long time to come," J. S. Vanick, metallurgist, International Nickel Co., pointed out in a talk before the Eastern Canada & Newfoundland chapter at the Mount Royal Hotel, Montreal, Nov. 14.

Mr. Vanick, author of numerous metallurgical papers, advised "not to worry about competing materials because there will be room for all in this period."

Dividing his talk into a discussion of steel, cast iron and bronze, Mr. Vanick showed slides to emphasize his points and urged that foundrymen make use of alloys in development of new fields for castings which were discovered by recent war experiments.

He continued: "Metallurgical processes in the foundry industry followed a simplicity common to all melting practices in the point that metal mixtures were melted down from available raw materials, refined, conditioned, alloyed, given a finishing refinement or treatment, heated to and poured, at controlled temperatures. Much progress has been made in applying well-known laws of physics on heat transfer to production of quality sand castings."

Alloy Steel Progress

Discussing high and low temperature steels, particularly low, Mr. Vanick said, that great progress has been made in low alloy steels designed to withstand temperatures of 200 to 250 degrees Fahrenheit below zero. Low temperatures make steels brittle, but today, he continued, it is possible to produce steel castings which will hold their toughness.

Bronzes, as a result of the wartime experiments, will extend their field of usefulness, he said, and research is being continued through

Members of the Central Michigan chapter during their plant visitation of the Albion Malleable Iron Co., Albion. Above—Inspecting the overhead core sand delivery system. Top right—Watching trimming operators. Bottom right—Jack Durr, of the company and Chapter Director, explains a press operation. Below—After visiting the Albion plant the technical meeting was held in the Parker Inn Hotel, Albion.

G. P. Halliwell (second from right), guest speaker at the November Central Illinois chapter meeting, chats with (starting left) Robert Dickenson and George Hazen, Brass Foundry Co., Peoria, and Charles Buckler, Jr.

experiments and development of new alloys first used during the war. Among the new developments listed was that of 80,000 pound aluminum bronzes used principally for sea water service.

Cast iron will have a greater field than ever before, Mr. Vanick predicted. Hundreds of tons of the International Nickel Company's alloy "Ni-Hard" are moving into the ore grinding mills at Canadian mines. During the war, nickel could not be spared from essential services for alloying materials used in the milling of gold ores.

The need for high quality castings will continue to keep foundrymen alert to the benefits bestowed upon their products through the use of nickel alloys, Mr. Vanick stated in conclusion.

Central Illinois

V. W. Swango
Caterpillar Tractor Co.
Chapter Reporter

A VERY interesting talk on "Non-Ferrous Foundry Practice" was presented to approximately 100 members and guests of the Central Illinois chapter on November 3 by G. P. Halliwell, director of research, H. Kramer & Co., Chicago, at the Jefferson Hotel, Peoria. Charles Buckler, Jr., Superior Foundry Co., East Peoria, was the technical chairman and A. V. Martens, Pekin Foundry & Mfg. Co., Pekin, chapter chairman, presided over the well attended meeting.

Metropolitan

W. H. Ferguson
Electro Metallurgical Sales Co.
Chapter Reporter

GUEST SPEAKER for the November meeting of the Metropolitan chapter in the Essex House, Newark, N. J., was F. W. Hanson, Electro Metallurgical Co., New York. George E. Hadzima, Robins Conveyor, Inc., Passaic, N. J., presided as technical chairman.

A general review of present day foundry difficulties with respect to raw materials and unavailable materials was followed by a discussion of possibilities in the way of substitutes which would be helpful in the production of high quality castings. Particularly mentioned were carbon control and sulfur problems which are outstanding in practically every foundry today. Possible steps for improving the situation in respect to these elements were covered briefly.

The use of various alloying elements and the function of each of these elements and how deficiencies could be made up were covered.

Inoculation of iron to improve physical properties together with suitable inoculating materials were discussed at length. Specialty irons for purposes such as heat resistance and abrasion resistance were also reviewed briefly.

Central Indiana

J. W. Giddens
International Harvester Co.
Chapter Secretary

A QUESTION and answer panel featured the November 3 meeting of the Central Indiana chapter. This is a very popular event with the membership and drew 100 members and guests to the Athenaeum, Indianapolis. Technical chairman was Richard Bancroft, Perfect Circle Co., New Castle, Ind. There were two spokesmen for each branch of the industry. The malleable men were: William Zeunik, National Malleable & Steel Castings Co., and Carl O. Schopp, Link-Belt Co.; non-ferrous, Paul Lee Hargitt, Light Metals, Inc., and Robert Langsenkamp, Langsenkamp-Wheeler Brass Works, Inc.; steel, Fred Kurtz, Electric Steel Castings Co., Speedway City, and G. C. Dickey, Harrison Steel Castings Co., Attica; and gray iron, J. P. Lentz, International Harvester Co., and R. E. Coady, Hoosier Iron Works, Kokomo.

Connecticut Non-Ferrous

Charles A. H. Knapp
Association Reporter

A NON-FERROUS speaker was the highlight of the October 15 meeting of the Connecticut Non-Ferrous Foundrymen's Association as they convened at the Hotel Taft, New Haven, Conn. The speaker was R. A. Quadt, American Smelting & Refining Co., Barber, N. J., and his subject was "Casting of Aluminum Alloys."

The speaker divided his topic into three classifications and elaborated on each in turn.

1. Type of metal melted or re-melted. Aluminum alloys should be dry and clean, free of surface corrosion. Preheat metal

(Concluded on Page 95)

OHIO STATE UNIVERSITY AND A.F.A. CHAPTER LEADERS MEET

OFFICERS OF five Ohio A.F.A. chapters met recently with faculty members, department of industrial engineering, Ohio State University, Columbus, to discuss the problem of cooperation between the university's foundry laboratory and the foundry industry.

Those officers present were of the opinion that:

1. Engineering students should be taught fundamental concepts at the engineering schools and receive their skills after entering the industry.
2. Careful placing of students for summer work is essential if continued interest by the student is to be maintained.
3. The chapters must give all-out support to the twenty-four students who have petitioned for the establishment of a student chapter at Ohio State University.
4. A quarterly news-letter be sent to the chapters from the foundry laboratory reporting all activities.

Plans for the improvement of the foundry laboratory are progressing and include the installation of a mechanical sand preparation unit and an overhead distribution system to eight molding stations. The laboratory has recently acquired a core oven along with a centrifugal casting machine, a shot blast cabinet and grinding tools. The establishment of a complete chemical, metallurgical and sand testing laboratory located within the foundry laboratory is being contemplated.

Men Present

The following attended the meeting: Elmer C. Zirzow, National Malleable & Steel Castings Co., Cleveland, Vice-President, Northeastern Ohio chapter; Victor E. Zang, Unitcast Corp., Toledo, acting for chairman G. R. Rust, Toledo chapter; C. F. Bunting, Pitcairn Co., Barberton, Chairman, Canton District chapter; A. D. Barczek, Bardes Forge & Foundry Co., Cincinnati, Vice-Chairman, Cincinnati District chapter; R. H. Frank, Bonney-Floyd Co., Columbus, Chairman, Central Ohio chapter; and F. W. Fuller, National Engineering Co., Columbus, Vice-Chairman, Central Ohio chapter. Representing Ohio State were: Dr. H. H. Davis, vice-president; Dr. J. S. Owens, Director, Research Foundation; Dr. P. N. Lehaczhy, chairman, department of industrial engineering, Dr. D. C. Williams, assistant professor and R. P. Schneider, assistant professor. Others present were P. E. Rentschler, president, Hamilton Foundry & Machine Co., Hamilton, Ohio and A.F.A. Technical Director S. C. Massari, Chicago.

Rolla School of Mines Petitions For Chapter

ACTING UNDER the new student chapter plan of the Association, petition has been received for the formation of a student chapter at the University of Missouri School of Mines and Metallurgy, Rolla, Mo. When approved by the Board of Directors, this new A.F.A. group will become the 40th chapter of the Association, following as it does on the heels of a petition for reconstructing the University of Minnesota student chapter.

Thus the Association's plan for creating foundry groups at prominent engineering schools and colleges has been twice accepted during the past month alone. In addition, another student chapter is already being organized at Ohio State University, Columbus, Ohio.

D. S. Eppelsheimer, Associate Professor of Metallurgical Engineering, will act as Faculty Advisor to the Missouri student chapter. G. E. Mellow, Liberty Foundry Co., St. Louis, will serve as Industrial Advisor representing the St. Louis District Chapter. A.F.A. policy requires the appointment of these advisors to assist student groups in formulating their meeting programs and to provide constant cooperation with the Association as a whole.

Officers of the Missouri student group are to be elected in the near future and real interest has been shown in foundry practice studies at the University. A complete cupola and other items of foundry equipment have been added recently to the school's equipment for foundry instruction.

The original petition includes names of 17 students, and others are expected to participate once the new chapter is approved and installed.

Re-Organize Minnesota Student Chapter

AFTER AN inactive status through the war years, petition has been received by National Headquarters for reorganization of the University of Minnesota Student Chapter, the first student chapter ever formed within the Association's framework. Seventeen students in the college of engineering have evidenced a desire for greater information on foundry work by signing the petition, and James H. Anderson, instructor in mechanical engineering at the University, will act as Faculty Advisor, as required under the A.F.A. student chapter policy.

Carter DeLaitte, Minneapolis Electric Steel Castings Co., Minneapolis, has been asked to serve as Industrial Advisor, representing the Twin City chapter. As in previous years, close cooperation is expected between the student and foundry groups of the Twin Cities, the Minnesota student chapter having been a major activity of the Twin City group in past years.

The student organization has already elected officers and directors, in addition to its advisors, as follows: Chairman, John F. Hermann; Vice-Chairman, Lyde M. Irwin; Secretary, Harvey S. Sauby; Treasurer, Ted M. Swanson; Program Chairman, Richard E. Fisher and Publicity Chairman, David Huch.

Acting in cooperation with A.F.A. Educational Director H. F. Scobie, formerly instructor in foundry practice at the University of Minnesota before joining A.F.A. headquarters, the student petition has been submitted to the A.F.A. Board of Directors, and prompt approval is expected. Installation of the new group, which again will be known as Chapter 21 as originally established, is expected shortly after the first of the year.

COMMITTEE DOINGS

Cupola Research

THE CUPOLA Research Committee held a very active meeting at which they discussed the present fuel situation and outlined a long range program for the study of new and improved means of operating the cupola. With the numerous problems arising from the shortage of coke the committee is endeavoring to develop recommendations which will be helpful to cupola operators now and in the future. These recommendations will be made on the basis of surveys conducted where certain operations are especially successful and after these observations have been tested in other plants to further substantiate the value of the results.

Job Evaluation and Time Study

A GENERAL discussion of the 1948 convention program was carried on and a long range program leading to a symposium on time study in the foundry was considered. Two sessions have been tentatively planned for the 1948 convention by the committee. It was also decided upon to pass out forms at the convention session on which members could indicate topics of interest.

Committee officers for 1947-48 are: R. J. Fisher, The Falk Corp., Milwaukee, *Chairman;* M. E. Annich, American Brake Shoe Co., Mahwah, N.J., *Vice-Chairman;* and E. G. Tetzlaff, Pelton Steel Casting Co., Milwaukee, *Secretary.*

Committee on Physical Properties of Iron Molding Materials

THE COMMITTEE reviewed the draft of the progress report on "Cause of Rat-tail Casting Defects" and studied the defects display.

Gray Iron

Program and Papers Committee

GENERAL PLANS for number of convention sessions and types of papers needed were discussed.

Reports were submitted to the committee by representatives of the gray iron shop course, cupola research, test bar, section size, microstructure, heat treatment and chill test committees.

James S. Vanick, International Nickel Co., New York, was appointed Chairman, Gray Iron Division Research Committee.

FUTURE CONVENTIONS AND EXHIBITS

American Association for Advancement of Science—National Meeting, Chicago, Ill.—Dec. 26-31.

American Chemical Society, Fourteenth Annual Symposium, Chicago, Ill.—Dec. 29-30.

Materials Handling Exposition, Second Exposition, Public Auditorium, Cleveland—Jan. 12-16.

Society of Automotive Engineers, Annual Meeting, Hotel Book Cadillac, Detroit, Mich.—Jan. 12-16.

American Society of Mechanical Engineers, Special Session of Management and Materials Handling Divisions, Cleveland—Jan. 13-14.

Institute of Scrap Iron & Steel, Inc., Annual Convention, Chicago—Jan. 19-20.

Refrigeration Equipment Manufacturers Association; Refrigeration and Air Conditioning Exposition, Cleveland—Jan. 26-29.

Birmingham Regional Conference, Birmingham, Ala.—Feb. 12-14.

American Society of Tool Engineers, 16th Annual Meeting and Tool Exhibition, Cleveland—March 15.

Magnesium Association, 4th Annual Meeting, Pennsylvania Hotel, New York City—March 18-19.

Chicago Technical Societies Council, Chicago Production Show, Stevens Hotel, Chicago—March 22-24.

National Association of Corrosion Engineers, Jefferson Hotel, St. Louis, Mo.—April 5-8.

AMERICAN FOUNDRYMEN'S ASSOCIATION, 52nd Annual Exhibit, Philadelphia—May 3-7.

Eastern Canada Group Holds Paper Contest

THE SECOND annual technical papers contest, sponsored by the A.F.A. Eastern Canada & Newfoundland chapter, has been resumed this year with the closing scheduled for February 3, 1948. Prizes will be given to the best papers submitted on some technical subject related to the castings industry.

Contest Rules

All A.F.A. members, and employees or associates, of member organizations are eligible and papers can be written in either French or English, with a minimum of 1500 words. A contestant can enter more than one paper and is required to obtain permission from his employee, in writing, to submit his paper. Photographs, graphs, drawings, sketches are desirable but not necessary.

O. L. Voisard, Robert Mitchell Co. Ltd., Montreal, and Chairman, Chapter Educational Committee, heads the contest and further details can be obtained from him.

Retirement Program At Wheelabrator

THE OPPORTUNITY to build up a sizeable retirement fund through savings and a share in company profits is provided by a new employee savings and profit sharing plan put into effect by American Wheelabrator & Equipment Corp., Misawaka, Ind.

The plan is retroactive to January 1, 1947. It affects all employees who join the plan and who have completed one year of continuous service with the company. All new employees become eligible to participate as soon as they have completed their first full year of service. The plan provides that a fixed percentage of the company's net income, before federal taxes, will be paid into the trust fund annually and pro-rated among participating members according to the number of profit sharing units accumulated during the year. The plan also includes a provision which permits employees, if they so desire, to deposit into the fund a limited portion of their savings from payroll earnings and thereby increase their share of the profits.

★ DECEMBER WHO'S WHO ★

J. A. Wettergreen

Speaking at the 1946 Philadelphia Regional Conference, Mr. Wettergreen presented a paper *Problems in the Production of Turbine Castings* which is reproduced in this issue . . . The author, who was born in Malden, Mass., has been assistant superintendent of foundries and pattern division, General Electric Co., Schenectady, N.Y., since 1942 . . . Mr. Wettergreen began his foundry career in 1930 as an apprentice with Bucyrus Erie Co., Milwaukee . . . Two years later he was appointed assistant to the superintendent and in 1934 was named assistant superintendent . . . During the period 1937-42 he served as superintendent of foundries and pattern shop . . . Has written for the trade press and is an A.F.A. member . . . A University of New Hampshire, Durham, graduate in 1930 with a Bachelor of Science degree in civil engineering.

C. C. Wright

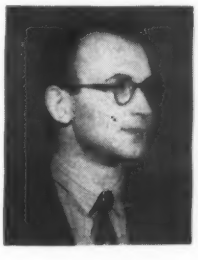
This is the concluding section of a two-part paper on the use of anthracite coal as cupola fuel . . . The first part was published in the November, AMERICAN FOUNDRYMAN, pp. 40-47 . . . Mr. Wright is affiliated with Pennsylvania State College, State College, Pa., and has been professor of fuel technology since 1939 . . . He has an additional post as chief of the fuels division at the Pennsylvania State College which he was appointed to in 1944 . . . Mr. Wright was born in Southport, England . . . Attended and graduated from the University of Washington, Seattle . . . Obtained his Bachelor of Science degree in chemical engineering in 1927, and his Ph.D. in 1931 . . . Research assistant at the University of Washington from 1931-32, he received a fellowship at the Pennsylvania State College through the National Research Council (1933-35) . . . Joining the college staff in 1935 as research associate, he was appointed associate professor in 1937 . . . His findings have been widely published by the trade press and he has talked before a number of technical societies . . . Member of AIME, American Chemical Society and American Society for Heating and Ventilating Engineers.

J. A. Rassenfoss

From the Sooner state comes John A. Rassenfoss being born in Miami . . . College attended: University of Kentucky, Lexington . . . Degrees: Bachelor of Science and Master of Science in metallurgical engineering, 1940 and 1941, respectively . . . Became associated with American Steel Foundries, research laboratory, East Chicago, Ind., in 1941, as research metallurgist . . . Has talked before a number of A.F.A. chapters and other technical societies, as well as A.F.A. conventions, on foundry sand practice . . . Chairman, Physical Properties of Steel Foundry Sands at Elevated Temperatures and Vice-Chairman, Mold Surface Committee and member, Executive Committee, A.F.A. Sand Division . . . A member of A.F.A., AIME and ASM.

D. J. Mack

Born: December 25, 1909, Madison, Wis. . . . Obtained his Bachelor of Science and Master of Science degrees from the University of Wisconsin, Madison, college of chemistry, in 1931 and 1932, respectively . . . In 1944 was awarded his Ph.D. from Purdue University, Lafayette, Ind., in metallurgy . . . Began his industrial career with C. F. Burgess Laboratories, Inc., Madison, as junior engineer (1932-33) . . . Held the same position with Globe-Union Mfg. Co., Milwaukee, from 1933-35 . . . Taught metallurgy at Purdue University until 1939 . . . Journeying to Knoxville, Tenn., he was affiliated with the TVA and University of Tennessee on a part time basis while doing consulting work . . . At the university he was assistant professor of chemical engineering and was associate metallurgical engineer for TVA, the former position lasting until 1945 and the later to 1944 . . . Became affiliated with the University of Wisconsin in 1945 as associate professor . . . Has written rather extensively for the trade press and various technical societies . . . Also a frequent speaker . . . Subject material: general physical metallurgy on structures and properties of metals and alloys . . . AIME, ASM and American Society for Engineering Education member.



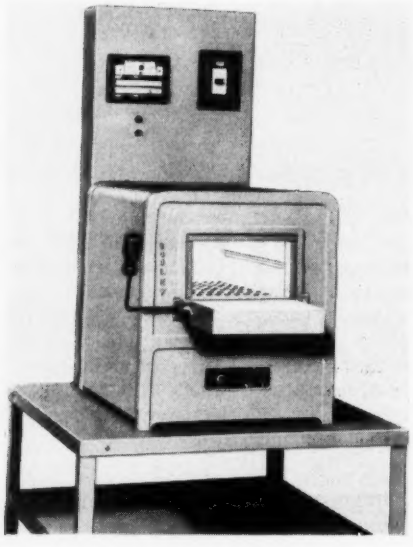
W. A. Baker

Author W. A. Baker is not new to readers of AMERICAN FOUNDRYMAN. . . . . He, with E. A. G. Liddiard, wrote the 1945 IBF-A. F. A. exchange paper, which concerned magnesium alloy microporosity (see September, 1945, AMERICAN FOUNDRYMAN, pp. 33-44) . . . From 1929-35, Mr. Baker was assistant chemist, Royal Mint, London . . . Graduated with honors from the London University, 1943, when he received his Bachelor of Science degree in metallurgy . . . Became associated with the B.N.F.M.R.A. in 1935 as junior investigator . . . Since 1939 has been senior investigator in charge of the Association's research on melting and casting of nonferrous metals.

C. B. Dick

Mr. Dick joined Westinghouse Electric Corp., Pittsburgh, Pa., in 1918 as inspector . . . In 1923 he was graduated from the Westinghouse Technical Night School and was made a foreman the same year . . . He served successfully as general inspector, a member of the personnel department, general foreman, assistant superintendent, superintendent and in 1943 was made manager of manufacturing . . . The author was appointed manager, feeder division, East Pittsburgh, Pa., in 1945 . . . Among the major departments included in this division are the iron and non-ferrous foundries, metal stamping, screw machine, electro-plating and galvanizing . . . Mr. Dick's birthplace was in West Wheat Field Township, Indiana County, Pa.

NEW FOUNDRY PRODUCTS



Air Draw Furnace

Cooley Electric Mfg. Corp., Indianapolis, Ind., has added two furnaces of the recirculating air draw type to their line of small electric box furnaces. The forced circulation furnaces are available in two types: the model ACL, for temperatures to 900° F, and the model ACH, which is designed for operation to 1200° F. May be used for tempering or drawing of both carbon and high speed steels, non-ferrous heat treating and various other uses. A temperature uniformity of plus 5 minus 0 degrees can be obtained. Accurate and simple temperature control is effected by a selective power modifier built into both furnaces, and operating with an indicating pyrometer. Heating elements are located behind vertical baffles at either side of the furnace chamber. In operation, the impeller type fan, mounted below the perforated cast metal hearth plate, forces air up between the baffles and the heating units. The power input of both furnaces is 4 kw. at 230 volts. The furnace chambers are completely metal lined, using mild steel in the ACL model and stainless steel in the ACH model. The chamber size is 10-in. wide, 6-in. high and 14-in. deep.

Servomechanism

W. C. Robinette Co., 802 Fair Oaks Ave., South Pasadena, Calif., has developed the motron. This is a packaged continuous-balance control system that can be applied to the automatic control or regulation of a large variety of practical problems. Several miniature vacuum tubes directly control (without circuit-breaking contactors) the speed and direction of a standard 1/15 horsepower induction motor, (according to the setting of the input-dial), which can be used to control other larger power sources. The input-dial controls either the velocity or position of the motor to very accurate limits. The velocity in either direction may be limited from zero to maximum independent of input-dial setting, so that hunting instability can never occur. The motor may actuate any device or mechanism (with 33-75 in-lb. torque, 0-29 RPM) that controls the process, state or condition that is measured on the input-dial, thus controlling and regulating the process.

Temperature Control

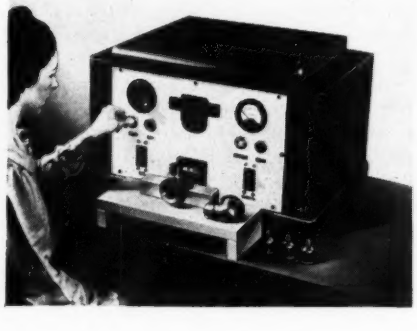
Claud S. Gordon Co., 3000 So. Wallace St., Chicago 16, has developed a precision temperature-variation control instrument, the "xactline capacitrol." The features include the "anticipating" factor which holds temperature tolerances as close as 1/5° F. plus or minus and power "on-off" cycles as short as 3 seconds, positive electrical action—no gears—cams—motors—bearings or other mechanical crutches, simple adjustment for wide range control requirements, and low initial cost plus low cost operation. The "capacitrol" incorporates the electronic control principle, instantaneous control action, direct reading indicating scale, separately enclosed measuring instrument and interchangeable unit construction.

Electrode

Westinghouse Electric Corp., P.O. Box 868, Pittsburgh 30, has made for direct-current reverse polarity welding of low alloy cast steel or low alloy high tensile strength rolled steels in all positions, the AP-MO electrode. Is available in three diameters from 1/8-in. to 3/16-in. Designed for making butt and fillet welds.

Induction Generator

Induction Heating Corp., 389 LaFayette St., New York 3, presents the "Ther-monic Model 43" bench-type induction heating generator. This unit is ready for operation immediately upon delivery by simply plugging into electric outlet. The model combines the power section and work applicator in one unit and is a source of high-frequency energy to speed up hardening, brazing, soft-soldering, annealing and melting operations. Lends itself to all types of mechanization. Single or multi-turn coils can readily be made by simply shaping copper tubing or wire to the work-piece. The controls provide for automatic or manual operation. The entire tube complement consists of one standard, heavy-duty, air-cooled, shook-mounted oscillator and two standard rectifier tubes. This equipment is fully protected by means of a plate overload circuit breaker and an instantaneous line circuit breaker, either of which will automatically shut off the generator if improper line voltage or load conditions should arise.



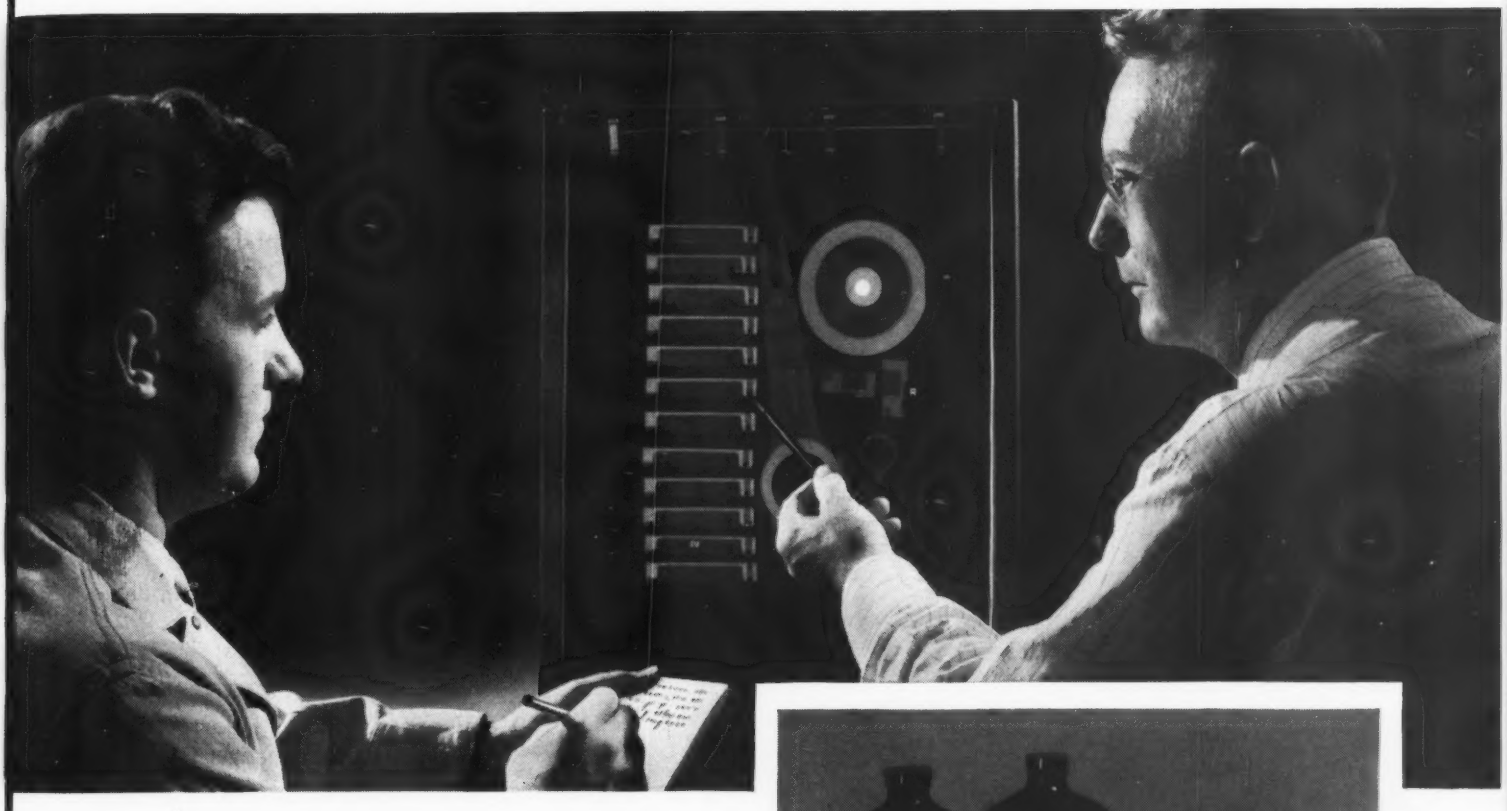
Automatic Furnace

Eclipse Fuel Engineering Co., 762 So. Main St., Rockford, Ill., has redesigned its automatic shop furnace. The unit is fully enclosed and completely houses all working parts. Furnace is shipped completely assembled and requires little floor space. Designed to meet the needs of shops requiring a small tool-room furnace for hardening materials. Can be used intermittently or continuously.

Dust Control Unit

Kirk & Blum Mfg. Co., 2839 Spring Grove Ave., Cincinnati 25, is manufacturing a self-contained dust control unit. This unit meets the needs of the large or small plants where layouts require the placing of one or more machines in buildings not served by the central dust control system. Unit is versatile; it can be set up anywhere to serve any machine for as brief or as long a period of time as needed. Will handle sawdust, grinding, buffing and polishing dirt from metal and wood working machines and all similar dust sources. Exclusive features include an air volume of 900 CFM at 2-in. suction, capacity for four 3-in., two 4-in., or one 6-in. pipe connections, and a four cubic ft. storage compartment, in addition to being semi-automatic in its cleaning operation.

For maximum detail visibility with better radiographic contrast . . .



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You simplify your purchasing problems . . . because you can get any liquid or powdered x-ray developer, fixer, replenisher, or auxiliary chemical you need . . . in convenient sizes . . . from Kodak's complete line of prepared x-ray processing chemicals.

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OTTAWA SILICA COMPANY
Ottawa, Illinois

HARVESTER CENTER

(Continued from Page 45)

to determine the effects of the melting media on metal properties.

In cooperation with engineering departments of the company, the manufacturing research foundry section will be able to produce castings of any desired composition, either plain or alloyed, and determine the best and most economical composition for a given application.

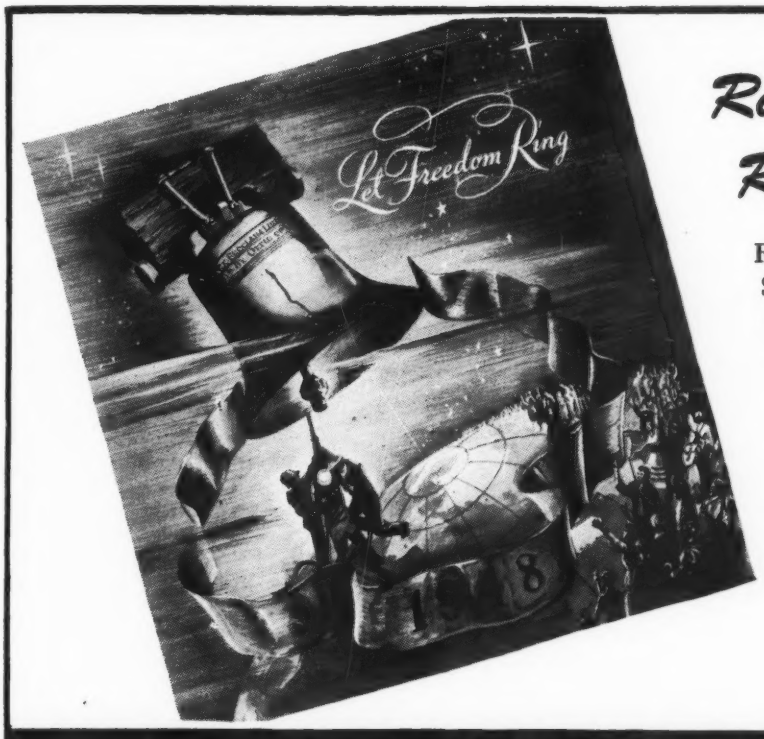
It is expected that the foundry section will be in complete operation by the end of 1948. When in full operation it will relieve all production foundries in the company of the major portion of the time and work spent in producing experimental castings under production conditions. In addition, the new foundry section will be in a position to try out and develop new raw materials and molding methods.

Begin Investigations

Despite lack of its major facilities and an established laboratory, the research foundry section is already carrying on investigations in coke substitutes, fluxing materials, and dryers in core oils.

At the present time, various Harvester gray iron and malleable iron foundries are producing castings at an annual rate of about 370,000 net tons. In addition, the company purchases a large tonnage of steel and iron castings. The production of such castings is one of the major operations of the Harvester Co. The innumerable problems which arise in connection with this major operation have made it advisable to establish a research section to relieve production foundries of studying new developments.

View of the Manufacturing Research Center, International Harvester Co. The Center is located at 5225 So. Western Ave., Chicago.



Ring out the old...

Ring in the new!

R. LAVIN & SONS, INC. greet the Holiday Season with the earnest hope that in 1948 the spirit of the Liberty Bell will again prevail throughout the world.

American Industry is now well on the way toward providing a more comfortable way of life for all of our citizens and we can look forward to still greater achievements this coming year. We wish our friends in the foundry industry a most active and fruitful year and pledge ourselves to continue to serve you to the best of our ability.

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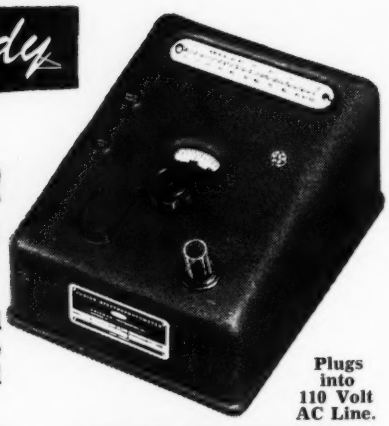

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Permits selection of precise light band required.

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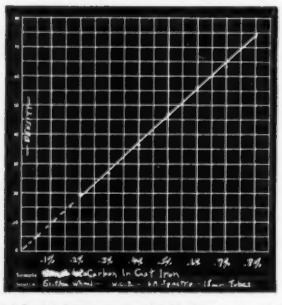
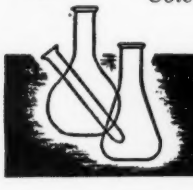


Combined Carbon in Cast Iron . . . just another example of the many uses you may have. You do the work using 6" x ¾" test tubes . . . instead of those long, unhandy, color matching tubes!



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Semet-Solvay Foundry Coke

for Better Melting

MICHIGAN STATE CONFERENCE

(Continued from Page 55)

Dodge Steel Co., Philadelphia was discussion leader, it was brought out that to accomplish maximum degree of efficiency in risering, effort should be made to design, mold and gate in a manner to insure maximum degree of shrinkage segragation. In molding, care should be exercised to select molding materials of quality and quantity which will induce more rapid solidification rate in selected areas furthest from the intended risers. In gating, care should be exercised to produce maximum temperature gradient favorable to solidification toward the riser. Effort should be made to assure access of atmospheric pressure to the internal liquid of the casting via the gate and risers.

Attaching Riser

A riser is attached to a casting section in such a manner that it is capable of delivering the necessary liquid to the shrinking casting. Riser the casting so that the shrink void will terminate in the riser for removal from the casting proper to enable riser removal without a void remaining in the casting. Listed below are three properties a riser should have:

1. Riser should be as small in volume as possible and get complete solidification ahead of the casting section.
2. Riser must have minimum attachment to the casting section on as near a flat surface as possible.
3. Riser must be so located that it serves to feed as many castings or as much of a single casting as possible, thus reducing the number of risers. If blind, it should be constructed as near spherical as possible with consideration of ease of molding.

Telling the foundrymen that coke conditions will not change drastically but that the pig iron future looks brighter, R. G. McElwee, Vanadium Corp., Detroit, began an informative talk on "Operating the Cupola Under Material Difficulties" at the gray and malleable iron round table discussion. W. B. McFerrin, Electro Metallurgical Co., Detroit, was technical chairman.

Commenting on the economies of operating the cupola with less coke, Mr. McElwee suggested that all

operators look into the situation thoroughly before making a move in any direction. Too many foundries change their cupola practice before they study the condition they are attempting to correct. Evaluate and do some research before any deviation is made. Record accurately what you are doing and how it is being done, too little technical information is being disseminated on cupola practice.

In the paper on "Mechanization in the Foundry" by W. R. Jennings, John Deere Tractor Co., Waterloo, Iowa, it was pointed out that foundry mechanization should be considered in terms of a complete foundry not just in terms of individual machines, such as molding machines and their capacities, but as a coordination and synchronization of the foundry operations, melting, molding, core-making and cleaning. Equipment alone does not mean mechanization, the speaker declared.

Student's Paper

To develop a simple and inexpensive technique for making test molds of foundry sand in which the hardness of the sand can be accurately controlled was the object of the tests conducted by Wayne Edwards and Lionel Washington, students, and C. C. Sigerfoos, engineering department, Michigan State College. Mr. Edwards read the paper and discussed the procedure, results and conclusions in their "Testing the Scabbing Tendencies of Molding Sands."

The banquet dinner was held in the Union Building with L. G. Miller, head, mechanical engineering department, Michigan State College, as the presiding officer.

An entertaining coffee talk was presented by J. G. Hays, assistant supervisor emergency farm labor, Michigan State College, as he described his own special cow.

Dr. T. H. Osgood, director, division of physical science, at the college discussed atomic energy. Pointing out the advantages of discovering atomic power, Mr. Osgood explained its possible use in medicine and as a new type of fuel.

Chemically coated sand, its preparation, use and advantages, were outlined by T. W. Curry, Lynchburg Foundry Co., Lynchburg, Va. (For details see AMERICAN FOUNDRYMAN, p. 51, June, 1947).

In talking "Non-Ferrous Casting Defects," H. M. St. John, Crane Co., Chicago, pointed out various types of defects and their causes.

There are three classes of defects as follows:

1. Defects due to castings being dimensionally wrong due to shifts, wrong size holes, etc.
2. Defects due to flaws such as sand holes and misruns.
3. Defects due to the metal being at fault due to poor physicals or shrinkage.

Pouring temperatures, especially for red brasses, must be closely controlled to obtain fine grain size in the casting and optimum physical properties.

The concluding paper presented at the conference was by E. E. Woodliff, Foundry Sand Service Engineering Co., Detroit, who spoke on "The Selection and Use of Core Oils and Binders."

Presiding officer at the Saturday morning session was Arthur H. Karpicke, Central Foundry Div., General Motors Corp., Saginaw, Mich.

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ONE OF A SERIES OF STORIES ABOUT ALLOYING METALS . . . WHERE THEY COME FROM AND HOW THEY ARE USED

THE STORY OF COLUMBIUM

IN HONOR OF AMERICA

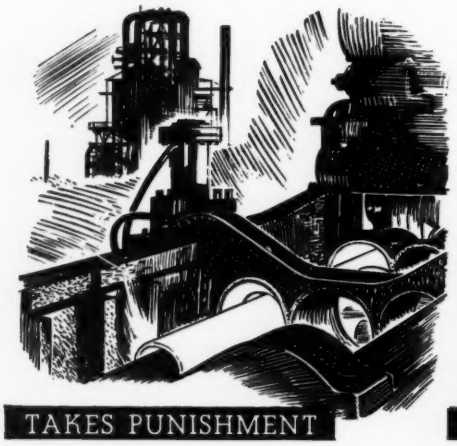
1 In 1801 the British chemist, Hatchett, discovered a new element and named it columbium, in honor of Columbia (America) whence came the mineral specimen he examined. For years this element seemed only an impurity in tantalum, but recently it has gained an important place in metallurgy.

NATIVE CONVEYOR BELT

2 From West Africa and other far-off lands come the ores of columbium, one of the scarcer metals. Here, native labor digs and carries the ore by hand to a modern washing plant which separates the ore from the gangue. From the concentrates, Electromet makes ferrocolumbium.

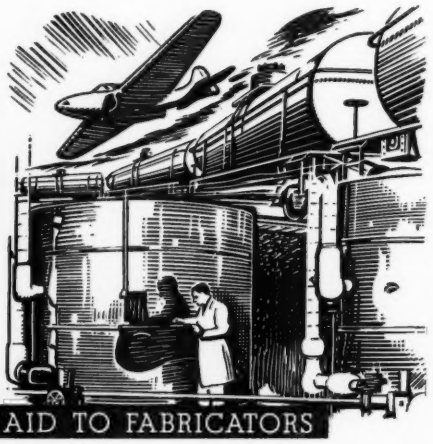
HEAT DOESN'T HURT

3 Columbium preserves corrosion resistance of austenitic chrome-nickel steel when heated to a high temperature. It is unnecessary to anneal welded equipment made of these steels. Fabricators may utilize forgings and castings of a size that could not be properly annealed by commercial methods.



TAKES PUNISHMENT

4 Columbium is essential for improving the creep strength of the super alloys for high-temperature applications such as blades and moving parts of gas turbines and jet propulsion engines. Columbium also reduces air hardening in the straight chromium steels, assuring ductility on cooling.



AID TO FABRICATORS

5 In chrome-nickel stainless steel equipment, welded without annealing, such as large tanks for the chemical, oil, and food industries, columbium preserves corrosion resistance. For high-temperature jobs, such as aircraft manifolds, columbium-bearing chrome-nickel steel is required.

Electromet Has Pioneered

. . . in the development and use of columbium and is the sole commercial producer of ferrocolumbium. If you seek new uses for your stainless or other alloy steels, or are faced with problems in their manufacture or fabrication, let our research staff work with you. Write to Electromet's Technical Service Department for the booklet "Electromet Products and Service." It will tell you more about columbium and other alloys and of our special service to metal producers and fabricators.

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Electromet

TRADE-MARK

Ferro-Alloys & Metals

STAFF ADDITIONS

(Continued from Page 62)

A. A. Hilbron

J. D. Murray

E. E. Chesire

Koeller was made Promotion Manager for all A.F.A. promotional activities. Mr. Murray has been connected with advertising selling and advertising agencies since 1939 in Cincinnati and Chicago, after

(Concluded on Page 90)

Buehler

Offers a Complete Line of Equipment for the . . . METALLURGICAL LABORATORY

Buehler specimen preparation equipment is designed especially for the metallurgist, and is built with a high degree of precision and accuracy for the fast production of the finest quality of metallurgical specimens.

1. No. 1315 Press for the rapid moulding of specimen mounts, either bakelite or transparent plastic. Heating element can be raised and cooling blocks swung into position without releasing pressure on the mold.

2. No. 1210 Wet power grinder with ¾" hp. ball bearing motor totally enclosed. Has two 12" wheels mounted on metal plates for coarse and medium grinding.

3. No. 1000 Cut-off machine is a heavy duty cutter for stock up to 3½". Powered with a 3 hp. totally enclosed motor with cut-off wheel, 12" x 3/32" x 1-1/4".

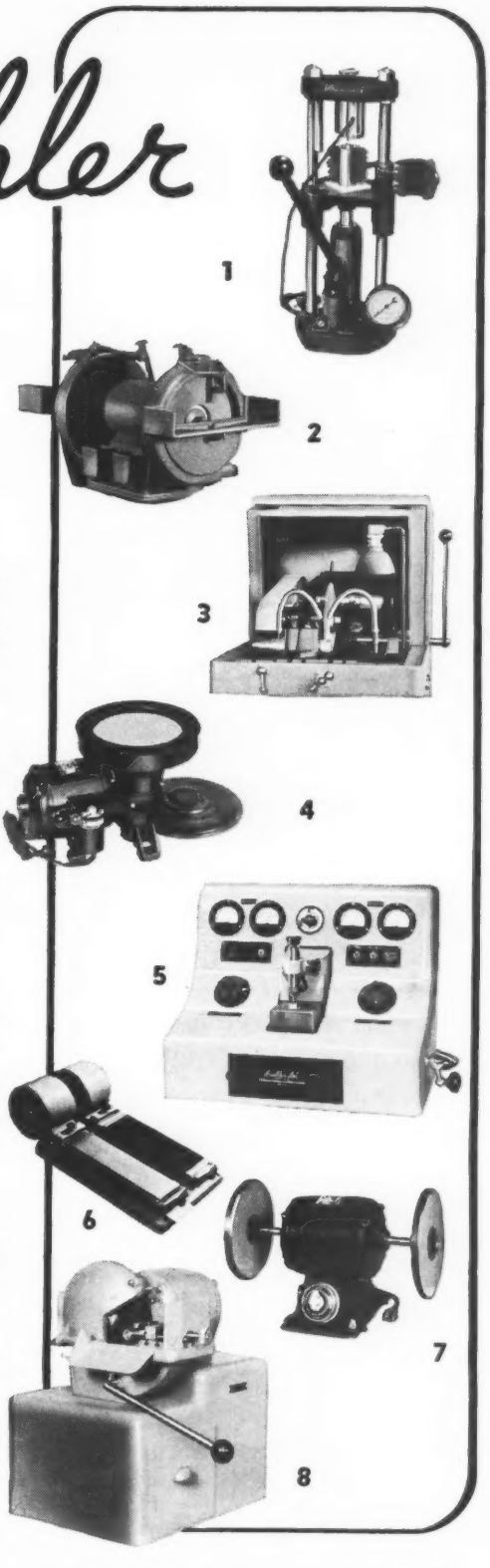
4. 1505-2AB Low Speed Polisher complete with 8" balanced bronze polishing disc. Mounted to ¼ hp. ball bearing, two speed motor, with right angle gear reduction for 161 and 246 R.P.M. spindle speeds.

5. No. 1700 New Buehler-Waisman Electro Polisher produces scratch-free specimens in a fraction of the time usually required for polishing. Speed with dependable results is obtained with both ferrous and non-ferrous samples. Simple to operate—does not require an expert technician to produce good specimens.

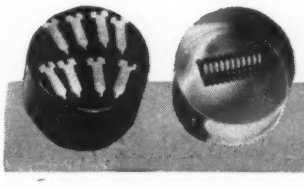
6. No 1410 Hand Grinder conveniently arranged for two stage grinding with medium and fine emery paper on twin grinding surfaces. A reserve supply of 150 ft. of abrasive paper is contained in rolls and can be quickly drawn into position for use.

7. No. 1400 Emery paper disc grinder. Four grades of abrasive paper are provided for grinding on the four sides of discs, 8" in diameter. Motor 1/3 hp. with two speeds, 575 and 1150 R.P.M.

8. No. 1015 Cut-off machine for table mounting with separate unit recirculating cooling system No. 1016. Motor 1 hp. with capacity for cutting 1" stock.



The Buehler Line of Specimen Preparation Equipment includes . . . Cut-off Machines • Specimen Mount Presses • Power Grinders • Emery Paper Grinders • Hand Grinders • Belt Surfacers • Mechanical and Electro Polishers • Polishing Cloths • Polishing Abrasives.



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NATIONAL LEAD COMPANY

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An A. F. A. Publication . . .

Recommended Practices for NON-FERROUS ALLOYS

Information contained in this important New A.F.A. publication has been compiled by the Recommended Practices Committee of the A.F.A. Brass and Bronze Division, and the Committees on Sand Casting of the A.F.A. Aluminum and Magnesium Division. A book that provides non-ferrous foundrymen with accurate, up-to-date data for the production of practically any non-ferrous alloy casting, and enables them to check present production practices against accepted standards and wide experience. An indispensable reference work wherever non-ferrous metals are cast . . . compiled by many leading foundrymen and metallurgists. Contains 159 pages, 42 tables, 35 illustrations; cloth bound.

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Some of the VALUABLE INFORMATION in this book . . .

Molding Practice . . . Finishing Practice . . . Melting and Pouring . . . Heat Treatment . . . Causes and Remedies of Defects . . . Properties and Applications

For the following alloys:

- **Leaded Red and Leaded Semi-Red Brasses.**
- **Leaded Yellow Brass.**
- **High-Strength Yellow Brass and Leaded High-Strength Yellow Brass (Manganese Bronze).**
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- **Aluminum-Base Alloys.**
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★ Sharper Castings
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★ Increase Tensile Strength
★ Increase Transverse Strength
★ Increase Wear Resistance
★ Increase Heat Resistance

Copper Shot

IMPROVES YOUR IRON

ALTER COMPANY Fifty Years of Service
1701 Rockingham Road, Davenport, Iowa

STAFF ADDITIONS

(Continued from Page 89)

receiving his education at DePaul University, Chicago, and Northwestern University, Evanston, Ill., where he majored in advertising and merchandising.

In 1941, as midwest advertising representative for a successful national magazine, he entered military service and spent considerable time in Europe as a 1st Lieutenant in the AAF and ATC. Mustered out in October, 1945, he returned to his previous connection, which he left to join the A.F.A. staff.

In order to increase the value of the A.F.A. library to the membership, Esther E. Chesire joined the Headquarters Staff on November 1 as Librarian. A graduate of the University of Iowa, Miss Chesire received a degree as a Bachelor of Library Science from the University of Illinois in 1934 and additional education in the graduate school of St. Louis University and at the University of Chicago and DePaul University, Chicago.

Twenty Years Experience

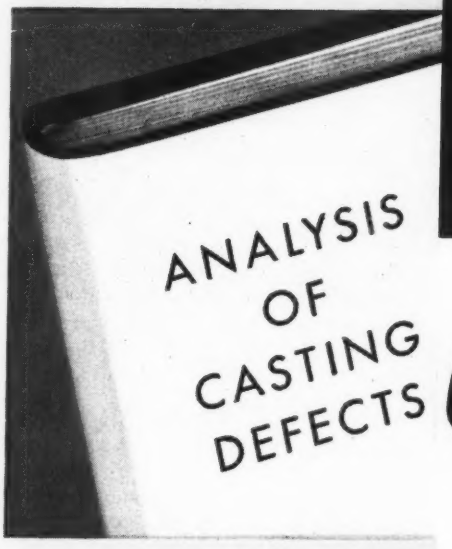
With over twenty years of experience in library work, Miss Chesire held the position of assistant librarian and cataloger at Illinois Institute of Technology, Chicago, from 1936 until this fall. She has been a member of the American Library Association, Illinois Library Association, Special Libraries Association, American Society for Engineering Education, and the Chicago Regional Group of Catalogers and Classifiers.

The A.F.A. library, one of the largest libraries on foundry practice in the United States, now is being completely reclassified.

Pardon Us!

A correction in the chapter directory published in the September issue, AMERICAN FOUNDRYMAN, p. 72, has been called to our attention. Under the Tri-State Chapter we erroneously listed Frank R. Westwood, Jr. This should have been Frank R. Westwood, Sr.

bringing together facts to help practical foundrymen eliminate



CAUSES OF CASTING DEFECTS

• Clear illustrations and comprehensive explanations add to the value of this book. For example, this reproduction of Fig. 16 carries the caption: Blow due to excessive moisture in the sand (4.5%), unnecessary ramming and insufficient permeability (90). Although it is often called a shrink, it is not because the hole is in the drag and extends upwards

a book describing and illustrating 31 basic casting defects

•Originally intended primarily for gray iron founders and prepared by men principally associated with the gray iron field, this book contains valuable information for all foundrymen.

•Every defective casting represents financial loss to the foundry producing it—a clear understanding of the causes of defects, therefore, is of paramount importance to every foundryman.

"Analysis of Casting Defects," a major project of the A.F.A. Analysis of Casting Defects Committee, is a detailed study on the correction of casting defects, discrediting the out-dated belief that carelessness is the chief reason for defective castings—101 figures clearly illustrate typical casting defects. It is only through elimination of contributing factors for failures that constructive steps can be taken to modify production methods and materials in order to correct a specific defect.

A comprehensive outline of the causes of gray iron casting defects lists 31 defects attributable to 10 specific and one general phase of foundry operation. This outline—a summary of the detailed causes included in the book—can be used advantageously to get an over-all picture of the probable cause of any defect.

First Edition . . . Cloth Bound . . . 148 Pages . . . 6 x 9 inches
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Company.....

Street Address.....
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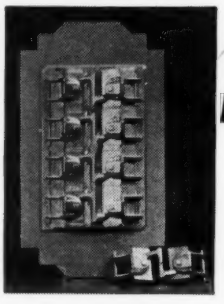

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Get more output with safety. That means, with greater accuracy. Foundrymen are thus helping their profit by using our pressure-cast matchplates and cope and drag plates. Single or multiple pattern matchplates cast under pressure in plaster molds—that's the proven answer to today's urgent production needs.

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CADILLAC MOTOR CAR DIVISION
General Motors Corporation
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Detroit 32, Michigan

Attention: Mr. C. W. Race

FOUNDRY PERSONALITIES

(Continued from Page 61)

J. C. Medford has been named sales engineer, Superior Foundry, Inc., Cleveland. Mr. Medford was formerly associated with the Dayton division of Chrysler Corp.

Link-Belt Company has made the following changes in their sales management personnel: **James B. Elliott** has been appointed divisional sales manager at the company's plant in Minneapolis; **Edwin A. Wendell** has been appointed sales manager for Caldwell plant with headquarters in Chicago; and **T. W. Matchett,** has been appointed district sales manager with headquarters at the Pershing Road Plant.

Mr. Elliott was formerly divisional manager of the Caldwell plant and his position has been filled by Mr. Wendell who was previously connected with the Pershing Road plant as district sales manager. Mr. Matchett was district sales engineer in New York.

Carl Gustav Syren, Foundry Manager, A. B. Nordiska Armaturfabrikerna, Linkoping, Sweden, was a recent visitor at A.F.A. headquarters. He is interested in general foundry operations as carried on in America and is visiting foundries in Chicago, New York, Cleveland, Cincinnati, Philadelphia and Pittsburgh.

His plant is the largest manufacturer of valves in Sweden and also makes air brakes which are supplied to the railroads of Sweden and many European countries. He is a member of the Association.

William Embry Wrather, director, United State Geological Survey, Washington, D.C., was recently elected president, American Institute of Mining and Metallurgical Engineers.

Other officers elected were two vice-presidents: **C. Harry Benedict,** Calumet & Hecla Consolidated Copper Co., Lake Linden, Mich.; and **Donald H. McLaughlin,** Homestake Mining Co., San Francisco.

Thomas G. Digges has been appointed chief, thermal metallurgy section, National Bureau of Standards, Washington, D.C. He succeeds D. J. McAdam, who has been chief of the section since 1930. Dr. McAdam retired in August.

Dr. Thomas P. May has joined the corrosion engineering section, development and research division, The International Nickel Co., Inc., New York. Formerly, since 1940, Dr. May was with the chemistry division, U.S. Naval Research Laboratory, Washington, D. C., where he served as head, corrosion section.

Edwin A. Murray and **Howard Boteler** have been made assistant managers, compressor division, Worthington Pump & Machinery Corp., Buffalo. Mr. Murray will be in charge of industrial and government compressor business and Mr. Boteler will be in charge of oil refinery and chemical compressor business.

Eugene Gifford Grace, Chairman of the Board, Bethlehem Steel Corp., Bethlehem, Pa., has been awarded the Charles F. Rand Gold Medal for "distinguished achievement in mining administration."

The 1948 award will be presented to Mr. Grace at the Annual Meeting of the AIME in New York City, February, 1948.

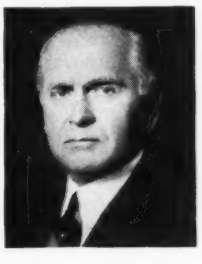
Julius Heuschkel, welding specialist, Westinghouse Research Laboratories, recently won first prize in the annual contest of the Resistance Welder Manufacturer's Association. Mr. Heuschkel is the first person to win the award two years in a row. He joined Westinghouse in 1944.

Obituaries

Joseph L. Trecker, 45, president of the Kearney & Trecker Corp., Milwaukee, builders of precision and production machine tools for milling and boring, collapsed and died of a heart attack at his desk Tuesday, October 7.

Mr. Trecker joined the company, founded in 1898 by his father, Theodore, and Mr. E. J. Kearney, in 1925 soon after he left college. He was widely known in industry throughout the country and was an officer and director of the National Machine Tool Builders' Association.

Merrill R. Taggart, founder, Taggart & Co., Philadelphia, died recently at his home in Holicong, Bucks County, Pa. He was a member of the American Foundrymen's Association and active in the workings of the Philadelphia group.



E. M. Allen

M. R. Taggart

Edwin Madison Allen, former chairman of the board and former president, The Mathieson Alkali Works, died on November 2 at his home in Rye, N.Y. He was 75 years old and was a director of the company at the time of his death.

William Keller, 63, retired president, National Bronze Foundry, Buffalo, died recently. Mr. Keller retired last year after 19 years as head of the foundry.

Frank G. Schaub, treasurer, Calumet Steel Casting Corp. and Z. V. S. Corp., both of Hammond, Indiana, died recently.

C. Ray Hanlin, Master Pneumatic Tool Co., Inc., Buffalo, N.Y., died recently.

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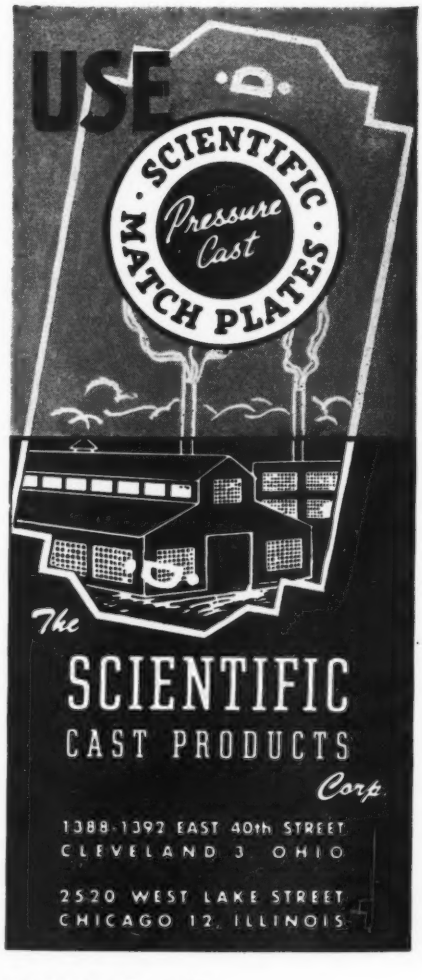

CHAPTER ACTIVITIES

(*Continued from Page 78*)

before putting into furnace. If corrosion products are present, sandblasting or modern cleaning methods should be employed to remove them. Such corrosion adds to the accumulation of aluminum oxide or dross and contains water which reacts chemically to form more and more dross, as well as hydrogen.

2. Melting and pouring. The speaker stressed that aluminum should not be stirred or cooled by addition of metal—rather permit a holding period of about 15 minutes which likewise enables the metal to free itself of dross. Generally, fluxes are not necessary, but if they are desired, stir them only into the layer of dross on top of the ladle. When properly used, the resultant should be only a dry layer of aluminum oxide. Aluminum with a little gas is better than a completely degassed alloy. It was recommended that bubbling chlorine gas through the melt under properly ventilated conditions be used as the best method of fluxing. Nitrogen gas may be used but it must be dry to prevent gas absorption. Another method of cooling a melt was to insert a coated cast iron slug.

3. Molding and gating. Molding sand should be permeable to allow escape of steam and mold gasses. The speaker suggested that castings having a very smooth surface are apt to give trouble when machined or used for pressure. To insure further success, vent the mold generously, use risers frequently as vents and also put whistlers through the cope. A whistler properly placed will sometimes act as a chill where a shrink apparently is in the casting but which really is a dip due to gas pressure in the mold. Use the sand as dry as can be safely worked to cut down the formation of steam.

A lively discussion period then ensued, notably on the effect of overheating. The speaker related that he had heated metal to 1700 degrees, made sure that it was properly de-gassed, cooled it to 1200 degrees and poured test bars with results superior to bars poured from metal heated only to 1200 degrees and then poured.

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"Jisco" Silvery is a "must" in the modern foundry. Its use means better castings at lower cost. It supplies the needed silicon.
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Band Saw
For sawing tubing, small rods, sheet metals, gates, risers, compositions, woods and hard rubber.
Furnished with high speed motor or with low speed geared head motor direct connected to lower wheel.
Cuts straight, circles and curves.
The finest Band Saw of its capacity ever built!
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"Oliver" Metal Cutting Band Saws are also made in 30", 36" and 38" sizes.
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GREY IRON CASTINGS

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ONE OF THE NATION'S
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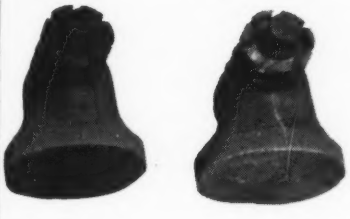
A PUMP BASE BEING CORE-UP IN DRY SAND

DELICATE IMPELLER CORES



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Way back in 1918, The Springfield Foundry Company made their first careful test of LINOIL. It proved so satisfactory for their core work that they adopted it immediately. Today—29 years later—LINOIL is still on the job at Springfield . . . making dependable cores, day after day, at lower costs.

In foundry after foundry—year in, year out—LINOIL has continued to meet the test of reliability, uniformity, and economy. The name LINOIL, has come to mean, "better cores at lower costs" in thousands of foundries. The list of long-time LINOIL users is most impressive. But even more interesting is the large number of new customers we gain each year who become regular LINOIL users.

All of which serves to indicate that most foundrymen consider LINOIL "the logical oil for cores".

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Whitehead Brothers Co. - Providence, R. I.
E. A. Wilcox - - - - San Francisco, Calif.
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